

**SCIENCE AND TECHNOLOGY PROJECT ON
INTEGRATED VECTOR CONTROL OF MALARIA,
FILARIA AND OTHER VECTOR BORNE DISEASES
(ANNUAL REPORT)**

**INTEGRATED VECTOR CONTROL OF MALARIA
1987**

MALARIA RESEARCH CENTRE

(Indian Council of Medical Research)
22-Sham Nath Marg, DELHI-110 054.



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1. PROJECT TITLE : Science and Technology Project on Integrated Vector Control of Malaria, Filaria and other Vector Borne Diseases.

SUB-PROJECT : Integrated Vector Control of Malaria

2. OVERALL OBJECTIVES :

- i) Integrated control of malaria in different agro-climatic regions of the country under the influence of different vector species/parasites and others socio-economic problems.
- ii) Development of cost effective model for extension and/or duplication in similar other geographical areas of the country.
- iii) Environmental improvement.
- iv) Exploitation of hitherto untapped natural resources as part of income generating schemes to make the programme self sustaining with minimum government support.

3. NODAL DEPARTMENT WITH COLLABORATING AGENCIES :

Nodal department : Indian Council of Medical Research

Collaborating Agencies :

- i) National Malaria Eradication Programme (NMEP)
- ii) State Health Departments
- iii) Department of Environment and Forestry (DOEnF)
- iv) National Wasteland Development Board (NWDB)
- v) Department of Rural Development (DRD)
- vi) Department of Non-conventional Energy Sources (DNES)
- vii) Local Institutions and other State Govt. Departments

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5. PROJECT MANAGEMENT STRUCTURE

4.5. BUDGET : Manager : Dr. V.P. Sharma, Director Malaria Research Centre

(i) Organization-wise break-up of the cost, time wise (as given in the project document)

Agency	1985-86	1986-87	1987-88	1988-89	1989-90
	(Rs in Lakhs)				
ICMR*	50	50	50	50	50
NMEP	-	100	100	150	150
Total	50	150	150	200	200

* : + Rs. 60 Lakhs for Delhi

(ii) Expenditure (Rs. in Lakhs)

Items	1985-86	1986-87	1987**
i) Pay-Allowance	00.21	12.08	24.21
ii) Transport	-	32.02	05.41
iii) Equipment	43.92	15.30	07.76
iv) TA/DA	00.01	01.09	02.64
v) Other Charges	05.56	15.41	13.70
vi) Capital	-	00.00	-
Total	49.70	75.90	53.72*

* : Rs. 46.0 Lakhs advance

** : Upto November, 1987

5. PROJECT MANAGEMENT STRUCTURE :

5.1 PROJECT MANAGER : Dr V.P. Sharma, Director
Malaria Research Centre
22-Sham Nath Marg
Delhi - 110 054

5.2 COMPOSITION OF EXECUTIVE COMMITTEE :

(Meeting at three monthly intervals at the field stations)

Dr. V.P. Sharma, Chairman
Mr. T. Adak (MRC, HQs)
Mr. R.K. Chandrahas (Madras)
Dr. C.C. Das (Berhampur)
Dr. V.K. Dua (Hardwar)
Dr. H.K. Nayak (Sonapur)
Dr. Amar Nath (Shahjahanpur)
Dr. M.S. Malhotra (Haldwani)
Dr. R.N. Prasad (Delhi)
Dr. Neeru Singh (Jabalpur)
Dr. P.K. Tyagi (Allahabad)
Dr. R.C. Sharma (Nadiad) Member Secretary
Mr. V.P. Gupta (A.O)
Mrs. Poonam Sharma (Audio-Visual and Publications)
Dr. (Mrs.) Aruna Srivastava (Computer)

5.3 COMPOSITION OF STEERING COMMITTEE :

(Meeting at six monthly intervals at the ICMR HQs office)

Dr. A.S Paintal, Chairman
Dr. S.P. Tripathy (Sr. Dy DG, ICMR)
Sh. Ashok Koshy (Sr. Dy DG, Administration)
Sh. R. Krishnamurthy (Sr. Dy DG, Finance)
Dr. G.K. Sharma (Director, NMEP)
Dr. A.B. Sen (Director, RPNI, Patna)
Dr. Anil Aggarwal (Director, CSE, New Delhi)
Sh. P.R. Das Gupta (Jt. Sec. Min. of Health)
Dr. O.P. Gupta (Director, Health, Gujarat)
Dr. D.K. Biswas (Director, Min. of Environment and Forest)
Dr. Kamla Choudhry, Chairman NWDB, New Delhi
Representative of Secretary Health, M.P.
Representative of Secretary Health, Assam
Representative of Secretary Health, Tamil Nadu
Representative of Secretary Health, U.P.
Representative of Secretary Health, Rajasthan
Representative of Secretary Health, Delhi
Representative of Sec. Health, Deptt. of Rural Development
Rep. of Sec. Hlth., Deptt. of Non-conventional energy Sources
Dr. Mrs. Manju Sharma, Planning Commission
Dr. Harcharan Singh, Planning Commission

6. SALIENT FEATURES OF WORK DONE :

6.1 M.R.C HQs, DELHI : The following activities are carried out at the HQs office.

- i) Central facility for data collection, analysis and retrieval
- ii) Research support
- iii) Transfer of technology to field stations
- iv) Preparation of exhibition, folders, video films and slide shows etc.
- v) Organizing executive committee, steering committee and SAC meetings
- vi) Organizing visits of important scientists/dignitaries to the field stations
- vii) Independent cross-checking of all field activities and providing direction and mid-course correction
- viii) Coordination and interphase with different agencies
- ix) Special studies in certain areas such as economic loss due to malaria and impact of health education etc.
- x) Holding national and international workshops, seminars, meetings etc.
- xi) Presentation of six monthly and annual reviews of the field work
- xii) Fixing targets for each activity of the field stations
- xiii) Research publications, communications, and writing report etc.
- xiv) Recruitment, site selection and arranging major equipments etc.
- xv) Organizing training courses

Targets for the MRC HQs are given in Table 1.

TABLE 1 : MRC HQs - TARGETS AND ACHIEVEMENTS*

ACTIVITIES		Targets	Figures	Achievements	Achievements - 000000 (cumulative data)			
: Status	:	1986	1987	1988				
: Till Dec:	Jan-Mar :	Apr-Jun :	Oct-Dec :	Jan-Mar :	Apr-Jun :	Jul-Sep :	Oct-Dec :	
Targets = Figures	Achievements	Achievements	Achievements	Achievements	Achievements	Achievements	Achievements	
Exhibition	1	-	2	3	4	5	6	7
Video	1	-	2	3	4	5	5	5
Hand outs	1	2	3	5	7	9	10	12
Audio Visual	-	-	1	-	-	-	-	2
Cross-checking	3	6	10	10	12	14	16	18
Executive committee meeting	1	2	3	4	5	6	7	8
Steering committee meeting	1	1	-	2	2	-	-	-
Training courses	1	-	1	-	2	4	5	6
* : till November, 1987								
** : Courses								
(1) Entomology (7-17 September, 1987) for Junior staff								
(2) Epidemiology (5-17 October, 1987) for Junior staff								
(3) Entomology (9-20 November, 1987) for Senior staff								
(4) Epidemiology (7-21 December, 1987) for Senior officers								

- ** : Courses
(1) Entomology (7-17 September, 1987) for Junior staff
(2) Epidemiology (5-17 October, 1987) for Junior staff
(3) Entomology (9-20 November, 1987) for Senior staff
(4) Epidemiology (7-21 December, 1987) for Senior officers

6.2 WORK DONE AT THE FIELD STATIONS :

6.2.1 KHEDA:

At present 0.7 million population comprising of villages and urban areas is under the protection by bio-environmental control strategy. Fig. 1 shows the location of experimental villages. It was proposed to take up Mahemdabad taluka by the end of 1987 and complete one million population, but unfortunately the consent of the state government has not been received so far. Therefore work has been restricted to 0.7 million population only. The targets of the field station are given in Table 2.

An in-depth assessment of the Kheda project was carried out by experts comprising of national and international scientists in October 1987. The report of this group is still awaited.

Entomological and parasitological indices were monitored throughout the year. Table 3 gives the results of monitoring of entomological parameters. The vector densities were extremely low throughout the year. Densities of other mosquitoes were also low in the experimental villages. Parasitological surveys revealed very low incidence of malaria (Table 4) in the experimental areas as compared to control villages. It was interesting to note that although there was some increase in the total number of malaria cases in experimental areas but this increase was very much pronounced in the areas under insecticidal spraying. Similar results were also seen in the vector/mosquito densities. The intradomestic breeding and that of well breeding was extremely low as compared to the control villages where it was very high. As regards other targets set out for 1987, the progress of achievements was satisfactory pre-set targets.

There is a regular flow of labour in the study areas from outside the experimental areas. A constant monitoring and epidemiological investigation has been instituted (Table 5). There is also an evidence of chloroquine resistance in Nadiad Taluka (Table 6). Drug resistant cases are being treated with Metakelfin. A study on the cost effectiveness of the actual expenditure incurred in Kheda versus the insecticidal spraying revealed that Bio-environmental control of malaria was the cheapest method of malaria control (see Table 7 & 8).

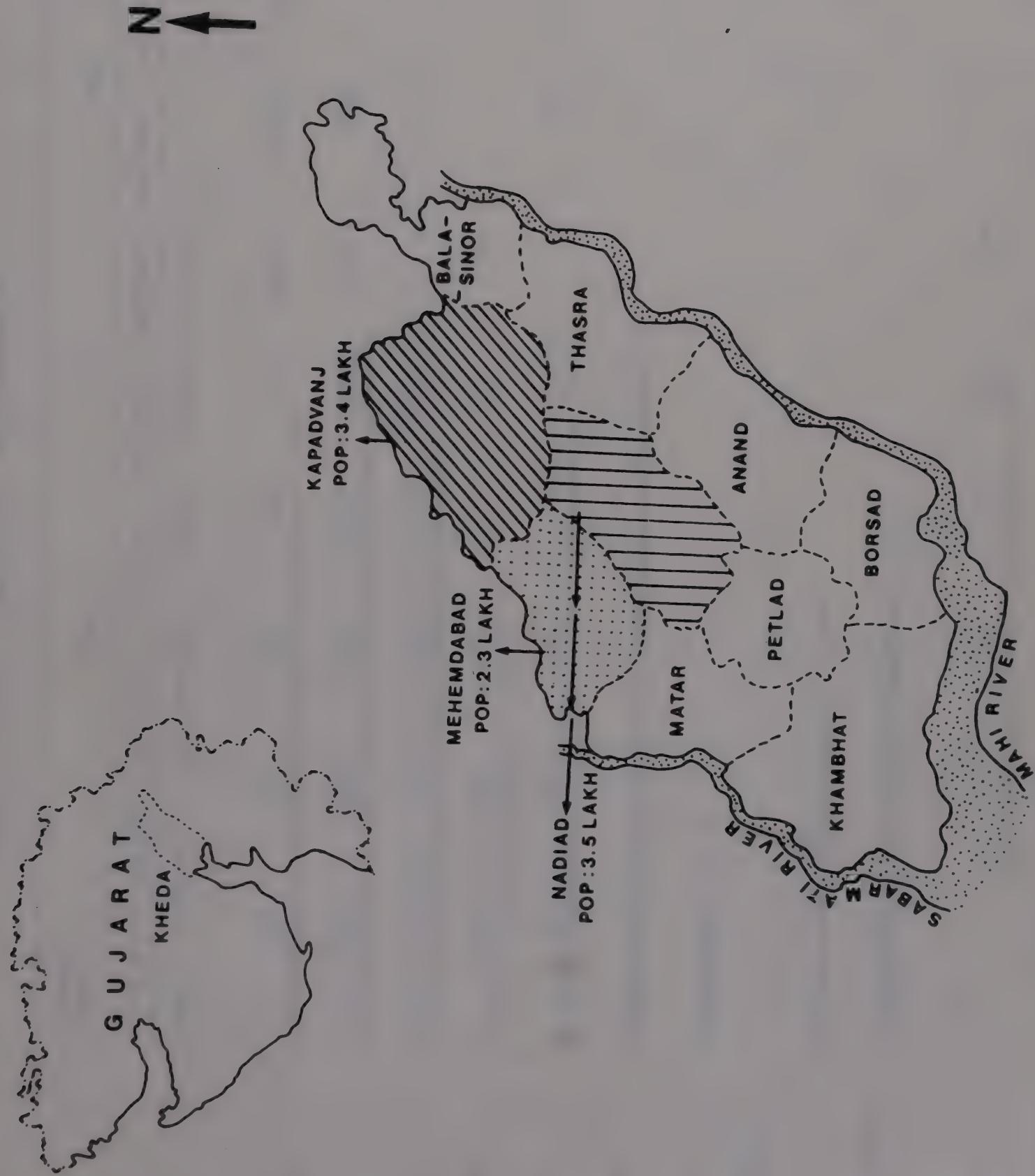


Fig 1: Showing the Location of Nadiad and Kapadvanj Talukas which are at present under the Bio-environmental control strategy. Mehemdabad Taluka is proposed to be included in the Experimental area.

TABLE 2 : KHEDA - TARGETS AND ACHIEVEMENTS*

	Status :	1986 :	1987 :	1988 :
ACTIVITIES				
: Till Dec : Jan-Mar : Apr-Jun : Jul-Sep : Oct-Dec : Jul-Sep : Oct-Dec :				
Targets = Figures Achievements - 000000 (cumulative data)				
1. MRC				
Population covered (in million)	.35	.07	.07	
Soak pits	833	1300	1500	2000
Hatcheries maintained	74	85	85	100
Health camps	122	150	200	-
Shram dars	25	35	45	-
Play grounds	1	-	-	2
Video film	1	-	-	-
2. NUDB/DOENF				
Saplings (in Lakhs)	.8	-	-	5
Tree plantation (in Lakhs)	2.8	-	-	7.8
3. DNES				
Solar cooker sold	25	50	75	120
Improved chulhas	1805	3000	4000	-
* : Till November, 1987	00000000000000000000000000000000 (3247)	-	5000	-
# : Maintenance				6000

TABLE 3 : KHEDA - MONITORING OF ENTOMOLOGICAL INDICES

Month (I & II half)	E X P E R I M E N T A L			C O N T R O L		
	Density			Density		
	Mosquito	Anopheline	Vector	Mosquito	Anopheline	Vector
January						
I	4.44	3.01	0.13	4.60	0.37	0.00
II	5.86	2.06	0.06	2.30	0.27	0.20
February						
I	10.12	7.32	0.26	31.06	22.26	0.26
II	41.60	36.00	2.40	52.80	40.40	0.80
March						
I	55.13	44.06	1.53	77.20	64.80	7.06
II	34.00	28.40	2.33	77.20	65.26	5.73
April						
I	34.40	30.20	3.20	125.60	111.70	15.06
II	17.80	14.20	1.06	76.26	67.80	2.40
May						
I	25.66	20.33	0.63	52.53	48.66	1.68
II	12.73	11.13	0.12	19.73	18.92	0.17
June						
I	18.25	16.30	1.61	47.00	43.60	4.31
II	15.50	14.40	1.23	27.40	25.70	1.00
July						
I	15.40	13.00	0.71	89.40	86.70	1.80
II	22.80	20.60	1.08	179.40	176.70	1.57
August						
I	96.95	94.75	0.58	239.80	236.00	1.58
II	155.95	152.30	0.43	314.80	308.40	1.67
September						
I	307.60	299.80	0.71	524.60	514.50	1.20
II	191.90	177.60	1.30	541.20	533.10	3.23
October						
I	197.30	190.20	3.16	444.80	442.20	14.00
II	69.90	66.80	1.66	203.80	200.10	5.30
November						
I	46.90	44.60	4.35	148.10	144.10	22.20
II	20.80	18.00	2.25	116.80	112.30	20.50

TABLE 4 : NADIAD - MONITORING OF PARASITOLOGICAL INDICES

Month (1987)	Population	BSC	tive	Pv	Pf	SPR	SFR
EXPERIMENTAL (NADIAD)							
January	347906	6069	19	9	10	0.31	0.16
February	347906	11630	10	6	4	0.09	0.03
March	347906	9923	21	17	4	0.21	0.04
April	347906	7715	53	42	11	0.69	0.14
May	347906	6400	53	48	5	0.83	0.07
June	347906	5815	79	73	4	1.36	0.06
July	347906	8829	87	76	10	0.99	0.11
August	347906	9947	92	75	17	0.92	0.17
September	347906	16197	163	119	43	1.01	0.26
October	347906	13482	343	243	98	2.54	0.73
November	347906	9778	290	180	110	2.97	1.12
Total	347906	105985	1210	888	316	1.14	0.29
EXPERIMENTAL (KAPADWANJ)							
January	344374	1166	3	2	1	0.26	0.08
February	337955	9146	7	3	4	0.08	0.04
March	337955	9103	19	14	4	0.21	0.04
April	337955	6775	33	27	6	0.49	0.08
May	337955	5645	66	63	3	1.17	0.05
June	338070	5975	78	74	4	1.31	0.06
July	338070	6756	56	55	1	0.83	0.01
August	338070	7259	31	31	0	0.43	0.00
September	338070	11980	121	99	20	1.01	0.17
October	-	-	-	-	-	-	-
November	338070	8231	850	48	36	10.33	0.43
Total	338070	72036	1264	416	79	1.75	0.11

TABLE 5 : RESULTS OF STUDY OF THE IMMIGRATION OF POPULATION INTO THE EXPERIMENTAL VILLAGES IN NADIAD TALUKA

TABLE 5A : NADIAD TALUKA

Year	Total cases	Pf cases	API for Nadiad	Inward Migration from (%)		
				Kheda Distt.	Other Distt.	Other States
Complex - A						
1984	72	45	2.76	66.7	31.9	1.4
1985	22	12	0.85	50.0	45.5	4.5
1986	33	25	1.27	45.5	54.5	0.0
Complex - B						
1985	38	12	1.46	57.9	42.1	0.0
1986	32	11	1.23	46.9	53.1	0.0
Complex - C						
1986	247	152	0.85	38.0	47.8	14.2

TABLE 5B : RESULTS OF MIGRATION PATTERN IN NADIAD*

	Total malaria cases	P.falciparum cases
Individuals	215	100
Labour**	184	145

TABLE 5C : SOURCE OF MIGRATION

Migration from	Total malaria cases	P.falciparum cases
Kheda	69	18
Gujarat	271	180
Other states	59	47
Total	399	245

* : January - August, 1987

** : SPR - 5.3 ; SfR - 4.2

TABLE 6 : EVIDENCE OF DRUG RESISTANCE IN NADIAD

Village	Ist attack*	Recrudescence I*	Recrudescence II*
		Interval in days from previous attack	
1986			
Bamroli	September 23	19	20
Sursamal	September 24	14	19
Tundel	September 26	14	32
Saluri	October 2	18	15
Narsanda	December 2	25	21
1987			
Vina	April 4	45	12

* : 1500 mg chloroquine + 45 mg primaquine

** : Metakelfin, no further recrudescence

TABLE 7 : EXPENDITURE REQUIREMENTS UNDER MRC PROJECT
FOR ONE MILLION COVERAGE

S.No	Current expenditure in lakhs
A. CURRENT EXPENDITURE	
1. Staff salaries	15.0
2. Drugs	1.2
3. Daily wage workers	18.0
4. Petrol/Diesel, repair of vehicles	4.0
5. Laboratory materials	1.5
6. EPS beads & other intervention raw materials	1.5
7. Travelling allowances etc.	2.0
8. Stationary and Miscellaneous	1.0
Total	44.2
B. CAPITAL EXPENDITURE	
Total asset requirement	35.3
Assets already in stock	30.2
Additional capital expenditure required	5.2
Current + Capital expenditure (Lakhs) in the intial year of expansion to 1 million coverage	49.7
Operational cost per capita	4.42
Total cost per capita	4.97

TABLE 8 : KHEDA DISTRICT NADIAD - DETAILS OF EXPENDITURE
INCURRED ON PAY AND ALLOWANCES ETC., ON EACH
CATEGORY OF STAFF OF MALARIA ORGANISATION
(1986-87)

S.No	Designation	No.	Pay & Allowance etc. in rupees
1.	District Malaria Officer	1	36,448.00
2.	Asstt. Dist. Mal. Officer	2	46,566.00
3.	Malaria Supervisor	13	2,73,888.00
4.	Malaria Lab. Technician	54	16,94,338.00
5.	Mal. Surveillance Inspector	6	14,58,295.00
6.	Mal. Surveillance Worker	46	36,23,836.00
7.	Head Mechanic	1	24,575.00
8.	Senior clerk	4	67,674.00
9.	Driver	2	37,973.00
10.	Superior Field Worker	2	19,875.00
11.	Field Worker (Class IV)	6	73,615.00
12.	Cleaner (Class IV)	3	40,936.00
13.	Peon (Class IV)	2	30,836.00
14.	Sweeper (Class IV)	1	9,147.00
15.	Contingency	-	1,27,714.00
Total			75,45,706.00
16.	Cost of antimalarials		1,20,000.00
Grand total			76,65,706.00
A.	Cost per million population		28,39,150.00
	Cost of DDT/million		34,00,000.00
	Total cost per million		62,39,150.00
B.	Cost per million population		28,39,150.00
	Cost of BHC/million		37,00,000.00
	Total cost per million		65,39,150.00
C.	Cost per million population		28,39,150.00
	Cost of Malathion/million		199,00,000.00
	Total cost per million		227,39,150.00

Note : Excludes items of capital expenditure

6.2.2 HALDWANI:

About 25,000 population is being protected in rural areas of Bhabar near Haldwani in Distt. Nainital, Uttar Pradesh (Fig 2). Field work was started in April 1986 and has since been expanded to 102 experimental (5000 ha.) and 4 control villages (Population 1,817). Targets and achievements of the Haldwani field station are given in Table 9. The area is well irrigated by a network of canals and the main occupation is agriculture. Water is stored in cement tanks for human and in ditches for cattle consumption which constitute the major and most problematical mosquito breeding sites. Road side water collections, river bed pools, intradomestic water storage and paddy fields are among other potential breeding sites.

Permanent and temporary breeding sites were searched on weekly basis and intervention measures were implemented to eliminate breeding. A total of 259279 breeding sites were surveyed in and around experimental villages of which 65724 were found positive for mosquito larvae (positivity 25.34%) whereas in control villages 20772 breeding sites were surveyed and 8471 were found positive for larvae (positivity 40.78%). A total of 6517 margins of shallow ditches were repaired and cleaned. Slurry around the drum of Gobar gas plant was treated with expanded polystyrene beads to eliminate mosquito breeding.

Larvivorous fishes of 3 species viz., Esomus danricus, Colisa fasciatus and Colisa chuna were used in the control of mosquito breeding in water reservoirs. In addition to these species, Gambusia and Poecilia are being stocked in large numbers for use in the control of mosquito breeding.

A total of 1.6 lakh fishes have been released in the breeding sites. Twenty stocking tanks are maintained in the experimental areas. Experiments were also conducted to assess the larvivorous potential of Notonectid bugs. About 4 lakh bugs were released in paddy fields which brought about limited control of mosquito breeding.

Two anophelines viz., A. culicifacies and A. fluviatilis were incriminated. Man hour density of vectors and other anophelines was recorded fortnightly. Mosquitoes attain high densities from late July to September (Table 10).

Active surveillance was carried out in experimental and control villages on weekly basis. Presumptive treatment followed the radical treatment to all malaria cases. A total of 17549 blood smears were examined, out of which 4721 were found positive for P. vivax, 959 for P. falciparum and 28 for mixed infections (Pv + Pf). The SPR has generally remained higher in control villages (Table 11).

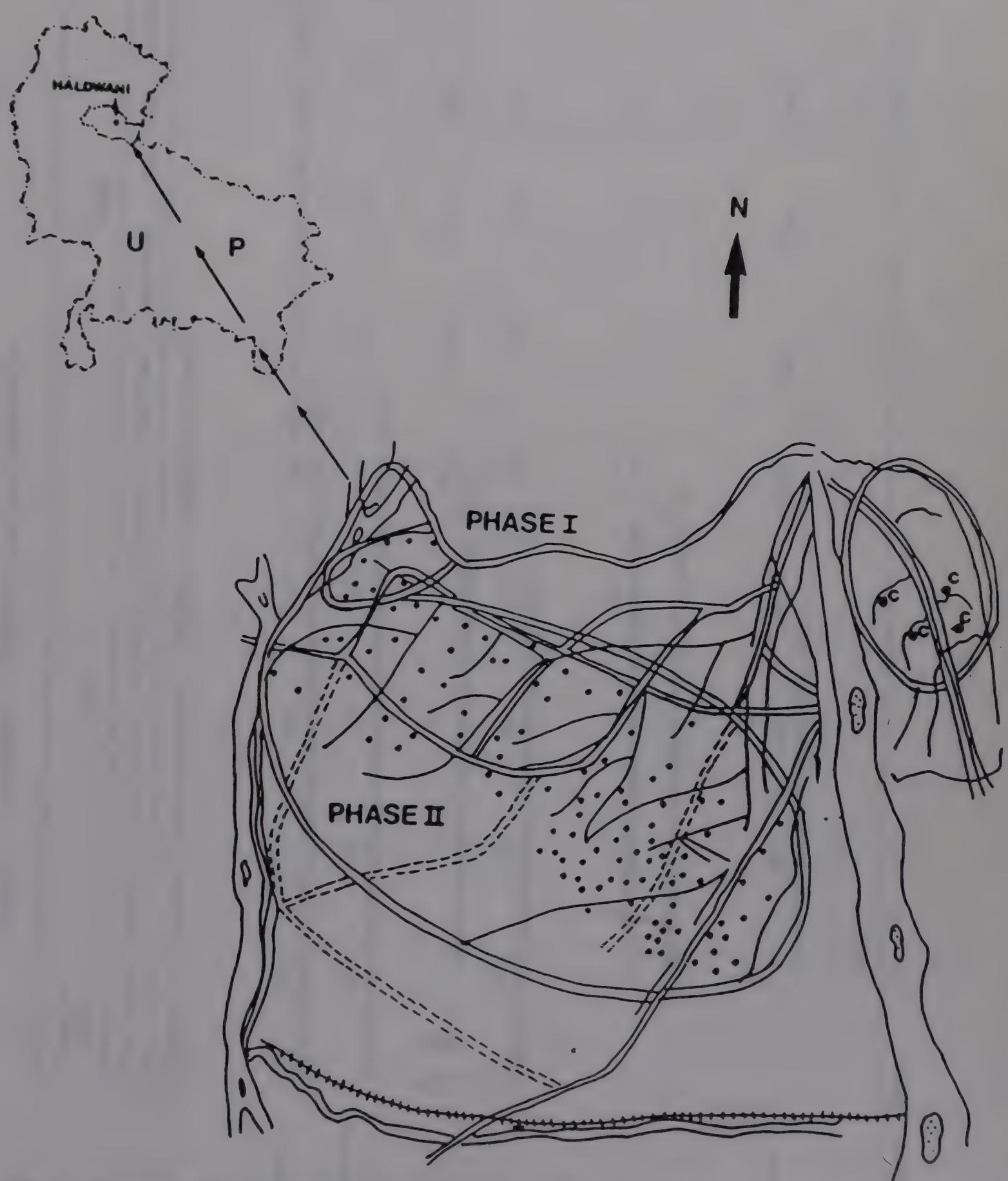


Fig 2 : Showing the Location of Experimental and Control Villages in Haldwani.

TABLE 9 : HALDWANI - TARGETS AND ACHIEVEMENTS*

	ACTIVITIES	Targets	Figures	Achievements	(cumulative data)
	MRC				
Villages covered	76	85	102	102	102+Urban 102+Urban 102+Urban
Population covered (in thousands)	20	25	25	25	00000000000000000000000000000000 (102)
Group meetings	-	-	-	350	00000000000000000000000000000000 (312)
Health camps	10	15	20	25	00000000000000000000000000000000 (26)
NVDB/DOENF					
Saplings (in thousands)	-	-	-	60	00000000000000000000000000000000 (74)
Nurseries maintained	-	-	-	-	00000000000000000000000000000000 (2)
DNES					
Improved chulhas	300	500	700	1000	1200 1200 1200
Biogas plants	1	-	-	2	- - -

* : Till November, 1987

TABLE 10 : HALDWANI - MONITORING OF ENTOMOLOGICAL INDICES

Month (I & II half)	EXPERIMENTAL			CONTROL		
	Density			Density		
	Mosquito	Anopheline	Vector	Mosquito	Anopheline	Vector
January						
I	-	0.05	0.003	-	-	-
II	-	0.02	0.036	-	-	-
February						
I	-	1.47	0.97	-	-	-
II	-	1.65	1.44	0.75	0.50	-
March						
I	-	4.03	1.52	-	0.50	0.25
II	-	1.24	0.33	-	1.25	0.25
April						
I	-	0.85	0.28	-	0.50	0.25
II	-	0.14	0.50	-	0.25	-
May						
I	0.53	0.54	0.15	0.13	0.13	-
II	0.73	0.73	0.05	0.50	0.50	-
June						
I	1.27	1.27	-	3.62	3.62	-
II	2.34	2.34	-	0.62	0.62	-
July						
I	4.50	4.50	0.06	2.75	2.75	0.06
II	43.79	43.79	2.26	13.50	13.50	0.56
August						
I	156.94	156.94	9.72	178.25	178.25	11.62
II	130.53	130.53	8.74	107.63	107.63	8.56
September						
I	51.70	51.70	8.04	47.50	47.50	9.50
II	24.74	24.74	6.42	13.25	13.25	4.18
October						
I	8.79	8.79	1.35	6.75	6.75	2.62
II	10.13	10.13	0.82	4.63	4.63	1.62
November						
I	4.17	4.17	0.22	3.50	3.50	2.50
II	1.95	1.95	0.05	0.37	0.37	0.00

TABLE 11 : HALDWANI - MONITORING OF PARASITOLOGICAL INDICES

Months 1987	Areas	Population Protected	BSE	Total positive	Pv	Pf	Mixed	SPR	SFR	
January	Expt. Cont.	25,652 2,936	778 64	143 14	115 13	28 1	-	18.38 -	3.59 1.56	
February	Expt. Cont.	23,724 1,817	814 108	98 19	82 14	16 5	-	21.87 -	12.03 1.96	
March	Expt. Cont.	23,724 1,817	946 85	95 16	85 16	10 -	-	17.59 -	4.62 -	
April	Expt. Cont.	23,724 1,817	955 109	152 23	147 23	4 -	-	10.04 18.82	1.05 -	
May	Expt. Cont.	23,724 1,817	1,316 108	304 35	300 35	3 -	1	15.91 21.10	0.52 -	
June	Expt. Cont.	23,724 1,817	1,235 117	410 42	408 42	1 -	-	23.10 32.40	0.30 -	
July	Expt. Cont.	23,724 1,817	1,303 112	462 41	459 41	2 -	1	33.19 35.89	0.16 -	
August	Expt. Cont.	23,724 1,817	2,675 40	1,224 12	1,031 12	185 -	1	35.45 36.60	0.23 -	
September	Expt. Cont.	23,724 -	3,914 -	1,811 -	1,479 -	322 -	10	45.75 -	7.21 30.00*	
October	Expt. Cont.	23,724 -	2,103 -	614 -	343 -	266 -	5	46.26 -	8.48 -	
November	Expt. Cont.	23,724 -	767 -	193 -	76 -	116 -	1	29.19 -	12.88 -	
	* : Point prevalence								25.16 -	15.25 -

* : Point prevalence

So far there has been no significant impact on the vector densities or on the transmission of malaria. The most likely reasons are the extensive breeding sites which are not easily amenable to control, mosquito migration and high parasite reservoir in the community. Population movement is also complicating the true assessment of the parasitological monitoring. The programme has been very well received by the community and there was great reduction in morbidity. Mortality due to malaria was completely eliminated.

Twenty six health camps were organised in villages and schools of experimental villages and 312 group meetings were conducted apart from door to door health education campaign. Four nurseries were set up for Eucalyptus and about 74,000 saplings were supplied to the farmers. A total of 524 improved chulahs were installed in the experimental villages.

6.2.3 HARDWAR:

Integrated vector control of malaria work at the BHEL Complex, Ranipur is in the maintenance phase after achieving an effective control of malaria and mosquito nuisance in BHEL Complex (See Fig. 3). The targets for the BHEL Complex and expansion into IDPL Complex and a few nearby villages are given in Table 12. At the BHEL Complex there was drastic reduction in density of Anophelines and that of vectors i.e. A. culicifacies and A. fluvialis. The reduction in other mosquito densities particularly Culex quinquefasciatus was not as significant although the mosquito populations were reduced to half or so (Table 13). This was mainly due to the immigration of mosquitoes from Jwalapur town which is only about 3-4 kms. away and breeds heavily for Culex quinquefasciatus. Monitoring of parasitological indices was carried out on weekly basis. SPR averaged 4 and SfR 0.07 (Table 14). Malaria incidence as compared to the previous year (1986) revealed that during 1987 malaria has almost disappeared and whatever cases are occurring, these are from outside the experimental areas (Table 15).

The study has been extended to IDPL Complex with a 25,000 population. The fly ash is being obtained from a nearby industry. The work on source reduction, minor engineering work and channelization has been intensified. Environmental improvement schemes such as social forestry, improved chulahas, sanitation etc. have been widely accepted by the community.

A survey of economic loss due to malaria was carried out during 1985-86. Actual expenditure incurred by the hospital and also by the individuals was calculated. Loss in production was calculated on the basis of production per capita of the BHEL. The total loss due to malaria was about Rs. 91.5 lakhs. The expenditure incurred by MRC on malaria control in BHEL Complex was Rs. 8 lakhs (Table 16). The integrated vector control of malaria was therefore highly cost effective and eradicated the disease on long term basis.

-  FUTURE TOWNSHIP
-  PRESENT TOWNSHIP
-  INDUSTRIAL AREA
-  SLUMS
-  MAIN FACTORY

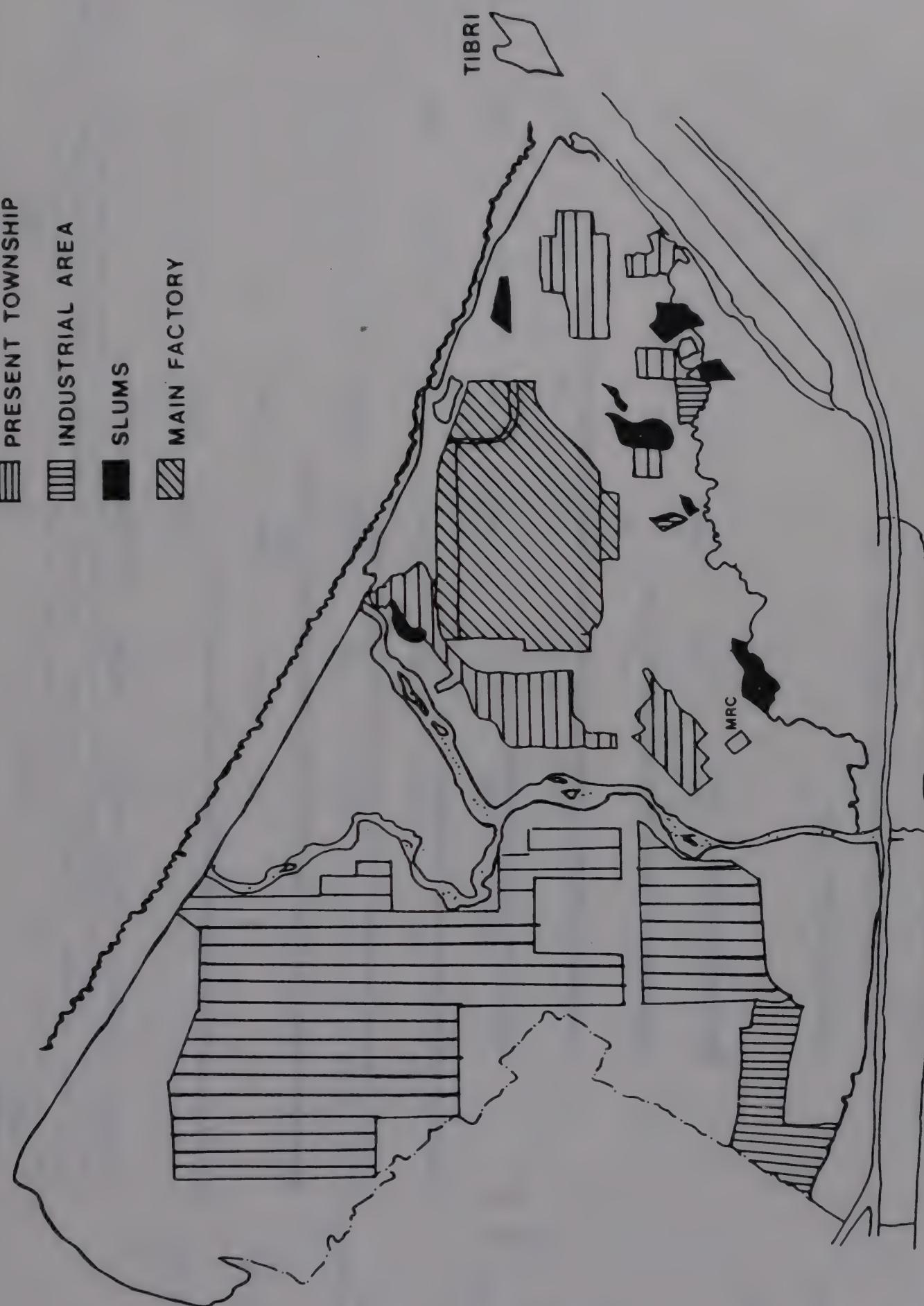


Fig 3: Showing the Experimental areas (townships & slums) at the BHEL Complex Ranipur, Hardwar.

TABLE 12 : HARDWARE - TARGETS AND ACHIEVEMENTS*

	Targets	Figures	Achievements	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	1986	1987	1988
ACTIVITIES												
Till Dec: Jan-Mar : Apr-Jun : Jul-Sep : Oct-Dec : Jan-Mar : Apr-Jun : Jul-Sep : Oct-Dec												
Targets = Figures Achievements - 000000 (cumulative data)												
1. MRC												
Villages covered	4	-	7	-	15	Main.	-	-	-	-	-	-
Planned colonies	4	6	7	7+idpl	bhel+idpl	Main.	-	-	-	-	-	-
Population covered (in thousands)	25	35	45	75	100	Main.	-	-	-	125	-	-
Soak pits	31	60	100	200	300	-	-	-	-	-	-	-
Group meetings	30	50	70	80	100	120	150	180	-	-	-	-
Health camps	2	6	8	12	20	25	30	37	-	-	-	-
Play grounds	4	7	10	15	-	20	-	25	-	-	-	-
Sanitation	10	50	70	100	120	-	-	-	-	-	-	-
2. NEDB/DOENF												
Saplings (in thousands)	-	50	-	-	-	-	-	-	-	25	-	-
Nurseries established	00000000000000000000000000000000 (3)	00000000000000000000000000000000 (3)	00000000000000000000000000000000 (3)	00000000000000000000000000000000 (3)	00000000000000000000000000000000 (3)	00000000000000000000000000000000 (3)	00000000000000000000000000000000 (3)	00000000000000000000000000000000 (3)	00000000000000000000000000000000 (3)	00000000000000000000000000000000 (3)	00000000000000000000000000000000 (3)	00000000000000000000000000000000 (3)
3. DNES												
Improved chulhas	-	20	100	150	200	250	300	350	-	-	-	-

* : Till November, 1987

TABLE 13 : HARDWAR - MONITORING OF ENTOMOLOGICAL INDICES

Month (I & II half)	E X P E R I M E N T A L			C O N T R O L		
	Density			Density		
	Mosquito	Anopheline	Vector	Mosquito	Anopheline	Vector
January						
I	17.00	0.50	0.50	23.00	14.00	8.00
II	22.25	0.50	0.50	34.00	16.00	11.00
February						
I	53.25	1.75	0.75	78.00	47.00	14.00
II	45.50	3.75	1.75	77.00	47.00	24.00
March						
I	70.25	4.75	1.75	158.00	50.00	12.00
II	48.25	0.75	0.25	127.00	3.00	1.00
April						
I	95.25	2.00	0.25	260.00	24.00	7.00
II	72.50	2.00	0.50	94.00	26.00	8.00
May						
I	69.00	3.75	0.75	80.00	23.00	10.00
II	59.75	1.25	0.50	56.00	31.00	11.00
July						
I	63.00	13.30	4.80	96.00	80.00	25.00
II	81.30	32.50	6.50	204.00	191.00	43.00
August						
I	74.75	58.25	4.00	252.00	232.00	52.00
II	59.25	34.25	1.50	182.00	174.00	57.00
September						
I	55.50	35.50	1.25	206.00	184.00	44.00
II	41.75	22.00	1.50	132.00	115.00	37.00
October						
I	52.00	23.50	3.50	138.00	128.00	42.00
II	49.00	17.00	2.50	108.00	96.00	37.00
November						
I	40.00	10.00	2.30	72.00	65.00	30.00
II	28.30	2.30	1.00	44.00	36.00	22.00

TABLE 14 : HARDWAR - MONITORING OF PARASITOLOGICAL INDICES

Months 1987	BSC	Total +ive	Pv	Pf	Mix	SPR	SFR
January	716	40	40	-	-	5.58	-
February	900	32	30	2	-	3.55	0.22
March	1085	40	40	-	-	3.68	-
April	1360	36	36	-	-	2.64	-
May	1015	38	37	1	-	3.74	0.09
June	1212	77	77	-	-	6.35	-
July	1589	98	98	-	-	6.16	-
August	1855	98	96	2	-	5.28	0.10
September	1885	59	57	2	-	2.97	0.10
October	1420	37	34	2	1	2.60	0.20
November	871	16	16	-	-	1.83	-
Total	14008	571	561	9	1	4.07	0.07

TABLE 15 : HARDWAR - RESULTS OF COMPARATIVE INCIDENCE OF MALARIA FROM PREVIOUS YEAR

Months	Malaria incidence			P.falciparum incidence		
	1986	1987	% Reduction	1986	1987	% Reduction
January	79	40	49	18	-	100
February	85	32	62	19	2	89
March	124	40	68	38	-	100
April	192	36	81	8	-	100
May	312	38	88	3	1	67
June	250	77	69	7	1	100
July	482	98	80	25	-	100
August	369	98	73	12	2	83
September	392	59	85	31	2	93
October	238	37	84	25	3*	92
November	119	26	78	16	10*	37
Total	2642	581	78	202	20*	90

* : Imported cases

TABLE 16 : HARDWAR - A STUDY OF ECONOMIC LOSS (Rs.)
DUE TO MALARIA AT THE BHEL COMPLEX
DURING 1985-86

Total Malaria cases	:	3,049
Population	:	45,000
Number of employees	:	12,200
<hr/>		
1. Individual Expenditure (Rs.) :		
Special food	:	1,01,197.00
Transportation cost	:	2,134.00
Loss due to leave without pay	:	22,723.00
<hr/>		
2. Expenditure incurred by Hospital/Management	:	42,00,000.00
<hr/>		
3. Loss in production	:	48,19,636.00
<hr/>		
Total		91,45,690.00
<hr/>		
One year expenditure (Sept. 86 - Aug. 1987)	:	8 Lakhs (includes all other schemes)
<hr/>		
NET GAIN	>	80 Lakhs
<hr/>		

6.2.4 SHAHAJAHANPUR:

The integrated vector control of malaria was launched in Dadural PHC in May 1986 in 21 villages. The study has since been extended to 136 villages so as to cover the entire PHC (Fig. 4). Target of the field station are given in Table 17. The progress in regard to the achievement of target was satisfactory. Mosquito and vector densities of Complex-A are given in Table 18A. Mosquito and vector densities have been reduced to low levels compared to the control, although similar reduction was not observed in Complex-B (Table 18B). Dadural PHC is waterlogged with innumerable breeding sites due to river, canal and waste water from the rice mills. Mosquito control by ecological and biological methods will take a long time but the impact of interventions is already visible in areas where most breeding sites have been successfully tackled.

Surveillance is carried out on weekly basis. The SPR has been reduced to about half as compared to the control villages (Table 19). There has been great reduction in morbidity due to good surveillance and prompt radical treatment. The programme has very high social acceptance.

MAP OF DADRAUL PHC SHAHJAHANPUR

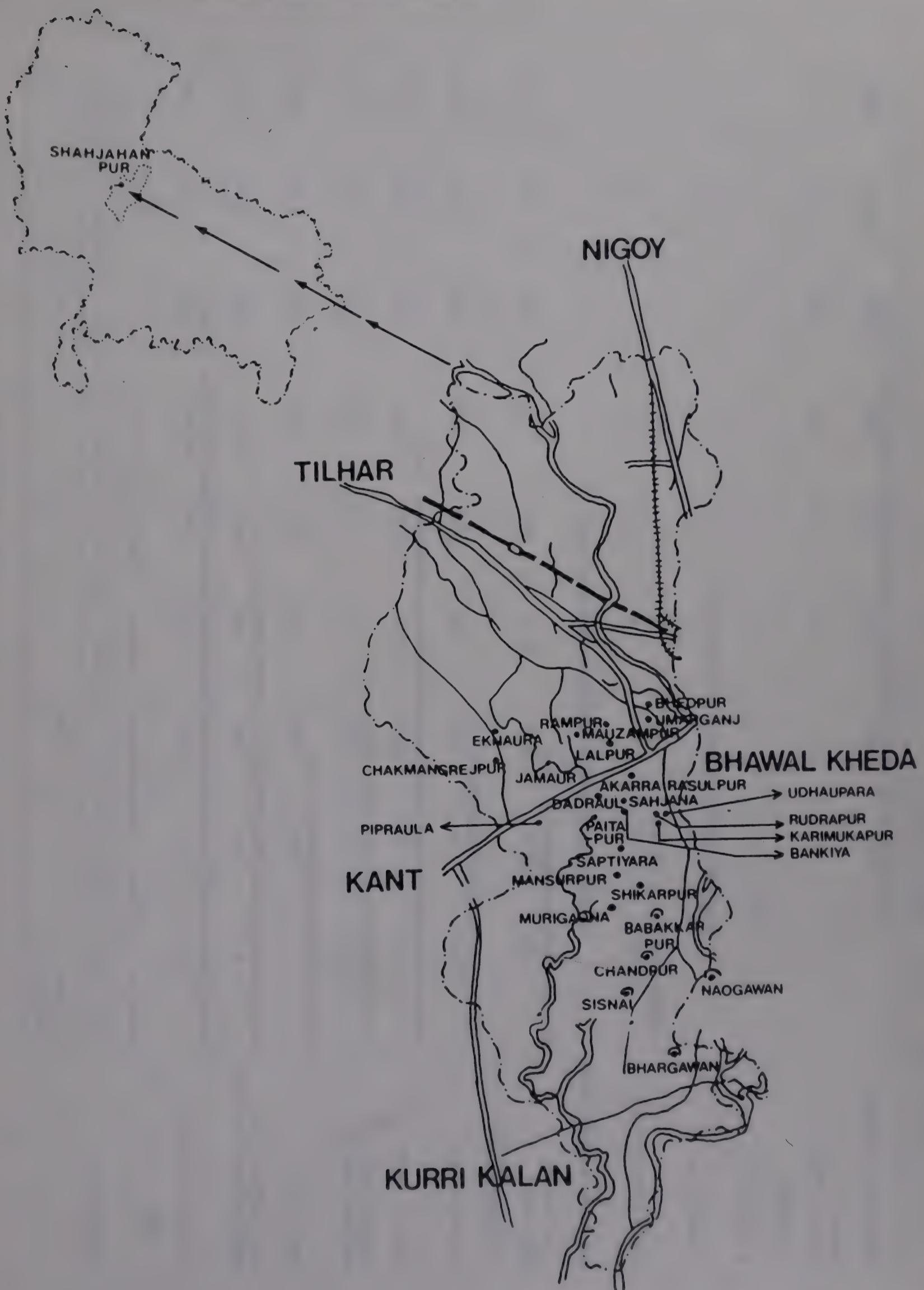


Fig 4 : Map of Dadraul PHC, Shahjahanpur district Twenty One (Complex - A)
Villages are shown in Fig. In August the entire PHC was taken up
Comprising of additional 135 Villages (Complex - B)

TABLE 17 : SHAHJAHANPUR - TARGETS AND ACHIEVEMENTS*

ACTIVITIES	Status : : 1986 : : Till Dec : Jan-Mar : Apr-Jun : Jul-Sep : Oct-Dec : Targets = Figures Achievements - 000000 (cumulative data)	1987	1988
1. MRC			
Villages covered	26	70	120
Population covered (in thousands)	00000000000000000000000000000000 (156)	21	65
Soak pits	000000000000000000000000 (115)	7	80
Hatcheries maintained	000000000000000000000000 (25)	5	15
Health camps	000000000000000000000000 (25)	21	70
Shram sans	000000000000000000000000 (101)	21	75
2. NWDB/DOENF			
Saplings (in Lakhs)	0000000000000000 (12.6)	10	12.5
Nursery established	000000000000000000000000 (12)		
Tree plantation	000000000000 (.02 H)	2300	-
Video film	000000000000000000000000 (1)	-	1
Slide show	NIL	-	-
3. DNES			
Solar cooker demo	NIL	-	-
Improved chulhas	000000000000000000000000 (1170)	200	400
* : Till October, 1987 ; # : Maintenance			
		200	500
		700	1000
		1600	2200
		000000000000000000000000 (1170)	2800

TABLE 18A : SHAHJAHANPUR - MONITORING OF ENTOMOLOGICAL INDICES
(COMPLEX - A)

Month & Fort- night	E X P E R I M E N T A L			C O N T R O L		
	Density			Density		
	Mosquito	Anopheline	Vector	Mosquito	Anopheline	Vector
January	135.57	31.77	4.80	208.30	55.95	14.35
February						
I	71.80	47.80	3.80	272.40	215.50	39.00
II	92.20	58.90	12.30	223.20	187.60	33.60
March						
I	84.60	48.42	8.50	277.40	223.07	40.30
II	80.37	48.00	9.20	261.50	149.47	37.26
April						
I	90.00	36.00	8.80	249.00	176.00	36.00
II	85.00	32.00	8.50	243.00	140.00	34.00
May						
I	97.00	40.00	11.00	225.00	166.00	38.00
II	96.00	38.00	10.50	233.00	158.00	35.00
June						
I	100.00	48.00	10.00	235.00	155.00	40.00
II	97.00	49.00	11.00	240.00	150.00	42.00
July						
I	105.00	46.00	12.00	226.00	138.00	77.00
II	102.00	39.00	11.00	223.00	130.00	62.00
August						
I	114.00	52.00	14.00	256.00	147.00	43.00
II	112.00	47.00	15.00	240.00	125.00	47.00
September						
I	106.00	48.00	12.00	241.00	149.00	46.00
II	104.00	50.00	11.00	230.00	132.00	48.00
October						
I	101.00	96.00	20.00	83.00	73.00	19.00
II	101.00	93.00	19.00	86.00	76.00	11.00

TABLE 18B : SHAHJAHANPUR - MONITORING OF ENTOMOLOGICAL INDICES
(COMPLEX - B)

Month & Fort- night	E X P E R I M E N T A L			C O N T R O L		
	Density			Density		
	Mosquito	Anopheline	Vector	Mosquito	Anopheline	Vector
February						
I	252.00	226.00	40.30	272.40	215.50	39.00
II	239.20	153.60	34.00	223.20	187.60	33.60
March						
I	263.00	196.60	43.70	277.40	223.07	40.30
II	277.38	223.07	40.30	261.50	149.47	37.26
April						
I	260.00	123.00	44.00	249.00	176.00	36.00
II	237.00	119.00	46.00	243.00	140.00	34.00
May						
I	240.00	112.00	40.00	225.00	166.00	38.00
II	238.00	110.00	41.00	233.00	158.00	35.00
June						
I	230.00	107.00	38.00	235.00	155.00	40.00
II	225.00	109.00	44.00	240.00	150.00	42.00
July						
I	239.00	110.00	35.00	226.00	138.00	77.00
II	235.00	111.00	49.00	223.00	130.00	62.00
August						
I	248.00	121.00	32.00	235.00	155.00	40.00
II	235.00	116.00	30.00	240.00	150.00	42.00
September						
I	196.00	105.00	30.00	241.00	149.00	46.00
II	193.00	106.00	28.00	230.00	132.00	48.00
October						
I	84.00	75.00	16.00	83.00	73.00	19.00
II	68.00	61.00	11.00	86.00	76.00	11.00

TABLE 19 : SHAHJAHANPUR - RESULTS OF PARASITOLOGICAL SURVEYS
(POOLED DATA FOR COMPLEX A & B)

Month	BSC	Pv	Pf	Mixed	Total positive	Pf%	SPR
EXPERIMENTAL							
January	1828	170	377	4	551	68.42	30.14
February	1453	127	178	4	309	57.61	21.27
March	1838	233	263	8	504	52.18	27.42
April	300	546	293	9	848	34.55	28.23
May	3913	844	217	12	1073	20.22	27.42
June	3858	985	77	2	1064	7.23	27.57
July	5138	1208	90	5	1303	6.90	25.36
August	6486	1677	179	2	1858	9.63	28.64
September	7305	1394	427	1	1777	24.02	24.32
October	6127	577	556	1	1134	49.02	18.50
CONTROL							
January	-	-	-	-	-	-	-
February	131	14	62	1	77	1.30	58.78
March	141	52	41	0	93	44.09	65.96
April	227	60	69	0	129	53.49	56.83
May	211	56	20	3	79	25.32	37.44
June	311	145	29	0	174	16.66	55.95
July	478	233	36	1	270	13.33	56.48
August	1000	423	88	1	512	17.18	51.02
September	616	207	171	3	384	45.31	62.33
October	593	91	169	1	261	64.75	44.01

6.2.5 MANDLA:

Bijadandi block covers a total of 82 sq.km. and the population comprises of some 40,000 people of which about 80 % belong to scheduled tribes. The experimental areas are shown in Fig. 5. The targets are given in Table 20.

Experimental villages are scattered and due to long distances from R.M.R.C Jabalpur, a field station was established at Bijadandi (Hard core tribal area), district Mandla. The field station became operational in May, 1987. Initially the study was launched in 10 villages (Fig. 5) with a population of 5,000 (Complex-A). In July-August, the study was extended to another 40 villages (Complex-B ; Population : 20,000) and in March the project was further extended to 30 more villages (Complex-C ; Population : 15,000).

Intensive source reduction efforts are being directed to control breeding in the main stream which supports heavy breeding of A. culicifacies and A. fluviatilis, the two important vectors of malaria. Guppy and two local species i.e. Rasbora and Dania are being used in the control of mosquito breeding. Approximately 90,800 fishes were released into different potential breeding sites. The margins of streams and ponds are cleaned regularly enabling the fishes to survive better, thus reducing the mosquito breeding.

In all 53 health camps were organized and more than 368 meetings were held by IDVC staff with school children, villagers and local potential resource persons. Fourteen gardens of fruit bearing plants (2,900 plant) were made in 13 villages with the help of community. Approximately 40,000 saplings were planted with the help of communities in the waste land.

During the year 350 trolleys of soil were used for levelling 7811 pits and depression besides routine earth work. Approximately 1038 new channels were made for waste water management.

More than 50 Shramdan were organised for source reduction and approach road were made. This gave an insight to the villages of what could be achieved by simple earth work.

As a result of intervention measures, there was a significant reduction in mosquito densities in the experimental villages for the entire duration of 1987 as against control (Table 21). The increase in mosquito density from August onward was due to delayed monsoon rains which continued for more than 3 months as regular showers.

There has been a drastic reduction in the incidence of malaria in experimental villages as compared to control villages. A total of 27,335 B.S were collected and examined from all the villages of which 4,292 were found positive for malaria. The incidence of falciparum malaria was much higher in control villages. The slide falciparum rate in experimental villages was

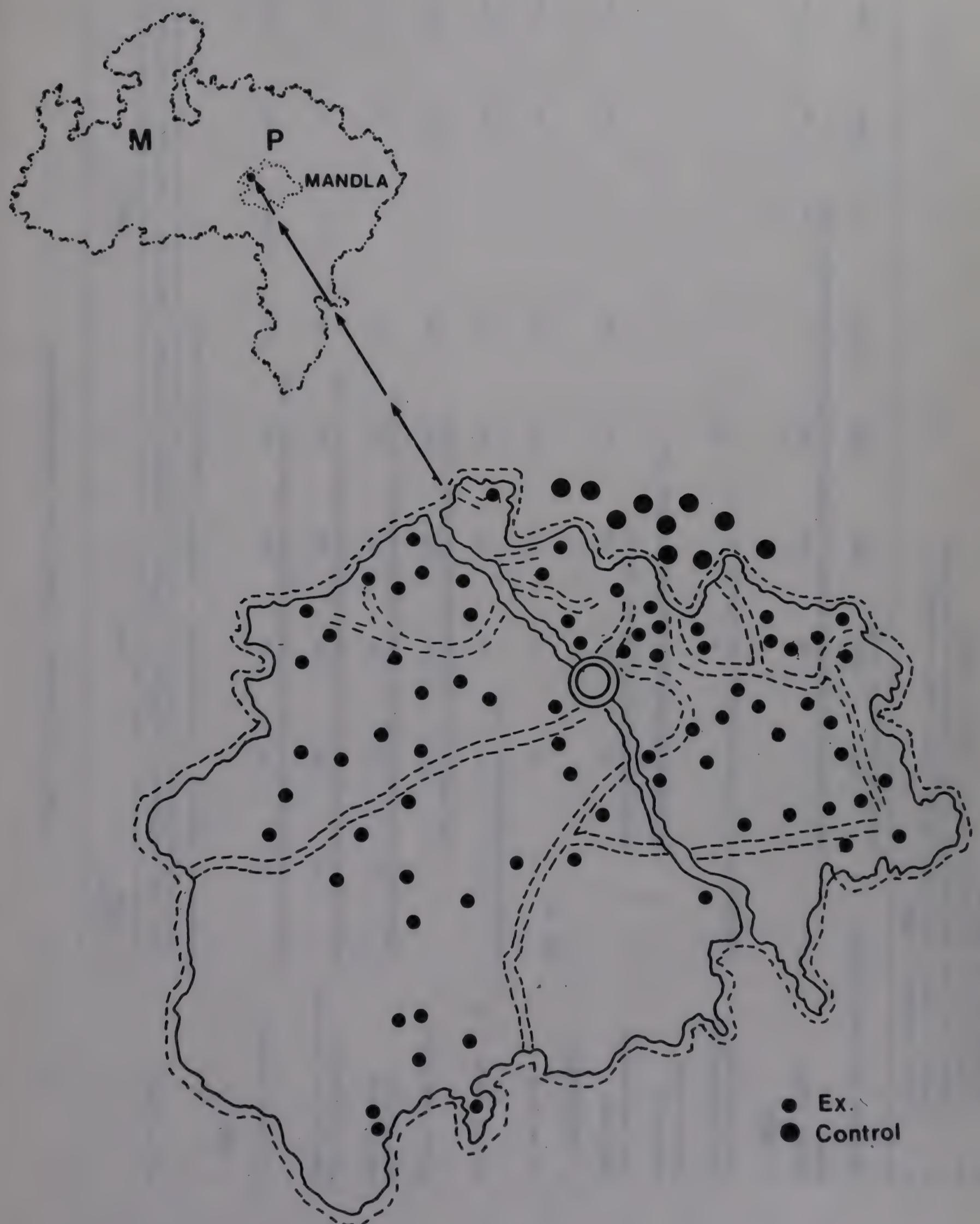


Fig 5: Showing the Location of Experimental Villages in Bijadandi block,
District Mandla, M.P.

TABLE 20 : MANDLA - TARGETS AND ACHIEVEMENTS#

	Status :	1986 :	1987 :	1988*
ACTIVITIES	Till Dec:	Jan-Mar :	Apr-Jun :	Jul-Sep : Oct-Dec :
Targets # Figures Achievements - 000000 (cumulative data)				
1. MRC				
Villages covered	50	70	80	80
Population covered (in thousands)	20	30	40	40
Hatcheries maintained	25	25	25	35
Group meetings	100	150	200	400
Health camps	10	37	40	57
Shram dars	-	10	15	35
2. NUDB/DOENF	000 (5)			
Saplings (in thousands)	30	35	38	40
Nurseries established	00000000000000000000000000000000 (12)			
Tree plantation (in thousands)	00000000000000000000000000000000 (15.9)			
3. DNES				
Solar cooker desao	00000000000000000000000000000000 (50)			
Improved chulhas/stoves	200	500	600	700
	00000000000000000000000000000000 (378)			
# Till November, 1987				
* Possible only with additional staff and transport				
** Base Line data collection of 25 villages as new block				
*** Maintenance of Biazandi block (100 villages)				
§ Disused wells/jherias				

TABLE 21 : MANDLA - PER MAN HOUR DENSITY OF ANOPHELINES IN EXPERIMENTAL/CONTROL VILLAGES

Month 1987	Complex - A		Complex - B		Complex - C		
	No. of villages	Anopheline density	No. of villages	Anopheline density	Vector density	No. of villages	Anopheline density
January	E 10 C 1	109.05 181.00	83.00 165.50	38 311.00	147.78 311.00	129.52 297.00	
February	E 10 C 1	62.87 105.50	49.20 97.00	37 180.00	78.80 171.00	72.31 171.00	
March	E 10 C 1	56.62 68.00	47.47 64.00	37 138.00	63.14 130.00	58.14 130.00	16 1
April	E 10 C 1	36.18 125.25	30.36 110.12	35 78.25	51.67 72.25	48.87 72.25	14 1
May	E 10 C 1	33.70 48.62	29.72 40.06	32 92.25	28.47 92.25	26.61 86.75	14 1
June	E 10 C 1	33.75 71.81	26.45 46.06	31 117.25	35.48 117.25	28.14 92.50	18 1
July	E 10 C 1	56.22 86.17	41.42 73.17	28 1	63.12 141.50	51.04 102.25	13 1
August	E 10 C 1	91.40 137.50	62.92 110.50	10 1	92.20 157.50	65.00 129.00	6 1
September	E 10 C 1	184.07 350.50	131.77 257.50	11 1	148.38 274.00	112.00 250.00	5 1
October	E 10 C 1	89.12 150.00	69.52 147.50	11 1	115.04 137.50	98.04 129.60	5 1
November	E 10 C 1	64.90 110.00	45.61 105.70	10 1	63.55 105.00	48.90 90.00	5 1

maximum in November 15.88%, While in control villages SfR was 56.99 (Table 22) during the same period. The intensity of malaria was so high in control villages that about 80% of the population had at least one attack of malaria between July to October, 1987. This information was used by NMEP and the control villages were sprayed with B.H.C and D.D.T during October and November 1987 in addition to routine spray rounds.

Sensitivity to chloroquine was tested in P.falciparum cases of experimental villages as a part of epidemiological investigation. A total of 2063 Pf cases were given 1500 mg chloroquine and 45mg primaquine. The cases showing recrudescence were followed for 28 days at 7d interval. All 302 cases showed chloroquine resistance and at least 66 cases showed recrudescence after 28 days. During this period they were checked for parasitaemia and administered only the presumptive treatment of 600 mg chloroquine (Table 23). All these cases (66) were treated after 28 days with metakelfin after checking for the presence of parasitaemia.

The child enlarged spleen rate was 11.80 and 47.13 in experimental and control villages respectively during September 1987 (Table 24).

Population movement in tribal areas also played a major role in spreading transmission. For instance out break of falciparum malaria was first recorded in kundum block, which is on the Jabalpur Mandla border (Fig. 5) and from this foci transmission spread to Jabalpur and Mandla. A study on the population movement showed that during monsoon season, 145 people visited experimental villages from neighbouring areas of these 96 people were found positive for malaria i.e. 63 Pv + 33 Pf (Table 25). Population movement is taking place at a much larger scale and a thorough study of migration pattern and its impact on disease transmission should be taken up for epidemiological interpretation of malaria situation in any given area.

During the year, 2875 cases of scabies and 2376 cases of conjunctivitis were treated in experiment village as part of community welfare programme to elicit positive response of people.

The following agencies helped in the implementation of the holistic approach to disease vector control in various ways.

- | | |
|------------------------------|---|
| State Government (Health) | - Regular supply of antimalarials |
| Forest & Block | - 2 rent free building |
| Forest & Horticulture deptt. | - 50,000 plants |
| District Administration | - Road construction |
| District Administration | - School building repairing |
| P.H.E | - Hand Pump |
| Villagers/School children | - Shramdan for road construction, Social forestry and Biological con- |
| Panchayats | - For waste land utilisation |
| Forest Department | - Seed, Manure and Polythene bags |
| Food & Nutrition Deptt. | - Nutrition Demonstration Programme |
| Urja Vikas Nigam | - Smokeless chulhas and Sigri |

TABLE 22 : MANDLA - EPIDEMIOLOGICAL SITUATION OF
EXPERIMENTAL/CONTROL VILLAGES

EXPERIMENTAL* - POPULATION : 40,000

Month 1987	BSE	tive	Pv	Pf	Mix	SPR	SFR	PF%
January	755	13	5	8	0	1.72	1.06	61.54
February	746	10	7	3	0	1.34	0.40	30.00
March	1065	12	11	1	0	1.13	0.09	3.33
April	1896	68	47	21	0	3.59	1.11	30.88
May	1900	186	162	26	0	9.79	1.37	13.98
June	2168	262	254	8	0	12.08	0.37	3.05
July	3714	356	323	33	0	9.59	0.89	9.27
August	2957	582	470	110	2	19.68	3.72	18.90
September	2677	677	495	180	2	25.29	6.72	26.59
October	6586	1523	740	775	8	23.12	11.77	50.89
November	2871	603	142	456	5	21.00	15.88	75.62

CONTROL** - POPULATION : 7,000

Month 1987	BSE	tive	Pv	Pf	Mix	SPR	SFR	PF%
January	54	4	2	2	0	7.41	3.70	50.00
February	51	4	0	4	0	7.84	7.84	100.00
March	101	5	3	2	0	4.95	1.98	40.00
April	184	15	5	10	0	8.15	5.43	66.67
May	309	72	37	10	2	23.30	3.24	13.89
June	170	40	34	6	0	23.52	3.52	15.00
July	150	30	26	4	0	20.00	6.66	13.33
August	452	218	133	93	2	48.23	20.58	42.66
September	696	447	208	237	2	64.22	34.05	53.02
Oct***	928	568	167	393	8	61.21	42.35	69.19
November	637	436	65	363	8	68.45	56.99	83.26

* : Surveillance is weekly in experimental villages and fortnightly in control villages

** : Control villages were sprayed with two rounds of DDT or three rounds of BHC

*** : Due to very high incidence of falciparum malaria, the areas was sprayed with special spray during Oct-Nov, 1987 to check further transmission FRT and MRT done. Field Labs were established to control the epidemic

TABLE 23 : EVIDENCE OF CHLOROQUINE RESISTANCE IN
P.FALCIPARUM IN MANDLA

Nos.	Pf cases	Pf cases after			
		7 days	14 days	21 days	28 days
2063	302	147		86	66
Dosage given	RT	PT	PT	PT	PT + metakelfin
RT -	1500 mg chloroquine + 45 gm PQ				
PT -	600 mg chloroquine				
Metakelfin -	2 tablets				

TABLE 24 : MANDLA - RESULT OF SPLEEN SURVEYS

Month (1987)	No. of children examined	No. of children with enlarged spleen	Blood slide positive		Spleen rate (%)
			slide	positive	
MAY					
Experimental	2588	234		13	9.04
Control	306	61		9	19.93
SEPTEMBER					
Experimental	1869	221		35	11.80
Control	558	265		188	47.13

TABLE 25 : MANDLA - RECORD OF POPULATION MOVEMENT IN EXPERIMENTAL VILLAGES

Month 1987	Migrated Population	M.P. +ive cases	Pv	Pf	Mix
June	21	12	9	3	-
July	19	13	12	1	-
August	20	12	10	2	-
September	27	24	16	8	-
October	58	35	16	19	-
Total	145	96	63	33	-

6.2.6 MADRAS:

The intervention in Madras city is in progress at present with a population of about 200,000 comprising of six corporation divisions. The intervention was commenced in 3 corporation divisions (86-88) in January 1987 and other three divisions (53-55) were added in August 1987 (Fig. 6). The targets of the field station are given in Table 26.

Overhead tanks and wells are the major sources of breeding of Anopheles stephensi, the vector of malaria in the city. However, cisterns and rain water collections also contribute to the breeding to some extent. The experimental areas have a total of 2894 open overhead tanks (797 overhead tanks in 86-88 divisions and 2097 in 53-55 divisions, and 8390 cisterns (3669 in 86-88 and 4721 in 53-55 divisions).

Larvivorous fishes (Gambusia affinis) have been introduced into 797 overhead tanks and 533 wells in corporation divisions 86-88 and into 2097 overhead tanks and 1667 wells in divisions 53-55. Fishes have been introduced at the rate of 10-15/overhead tank and 20-25/well. As far as the cisterns are concerned the residents are being educated to dry the containers by changing the water once a week or mosquito proof the cisterns.

Following the introduction of Gambusia fishes there has been a drastic decline in the number of overhead tanks found positive for anopheline breeding. Weekly checks revealed that positive overhead tanks did not exceed 5% of the total overhead tanks with water during the 8 months post intervention observations (Table 27). In wells also there was an appreciable decrease in anopheline breeding. Only about 1% of the wells were found positive for anopheline breeding for the major period (Table 28).

Reintroduction of fishes was necessary in about 25% to 29% of the OHTs except for August IVth week when 31.47% of the OHTs and upto 25% wells needed reintroduction.

The parasitological findings of the work done by Madras Corporation and MRC are given in Table 29. In the experimental area (86-88) there were 579 cases of malaria in 1987 (upto October) as against 843 recorded during the corresponding period in 1986 (31% reduction). In the other experimental area (division 53-55), it is too early to asses the impact of intervention.

Mass blood surveys were undertaken in both the experimental areas. In the corporation divisions 86-88, a total of 35 positives were detected (28 Pv, 7 Pf) out of 1335 blood smears collected. In the other area, 36 positives were detected (32 Pv and 4 Pf) out of 3234 blood smears examined. In October and November mass survey was again carried out and 22 positive cases out of 165 and 20 out of 136 blood smear examined were found positive respectively in October and November.

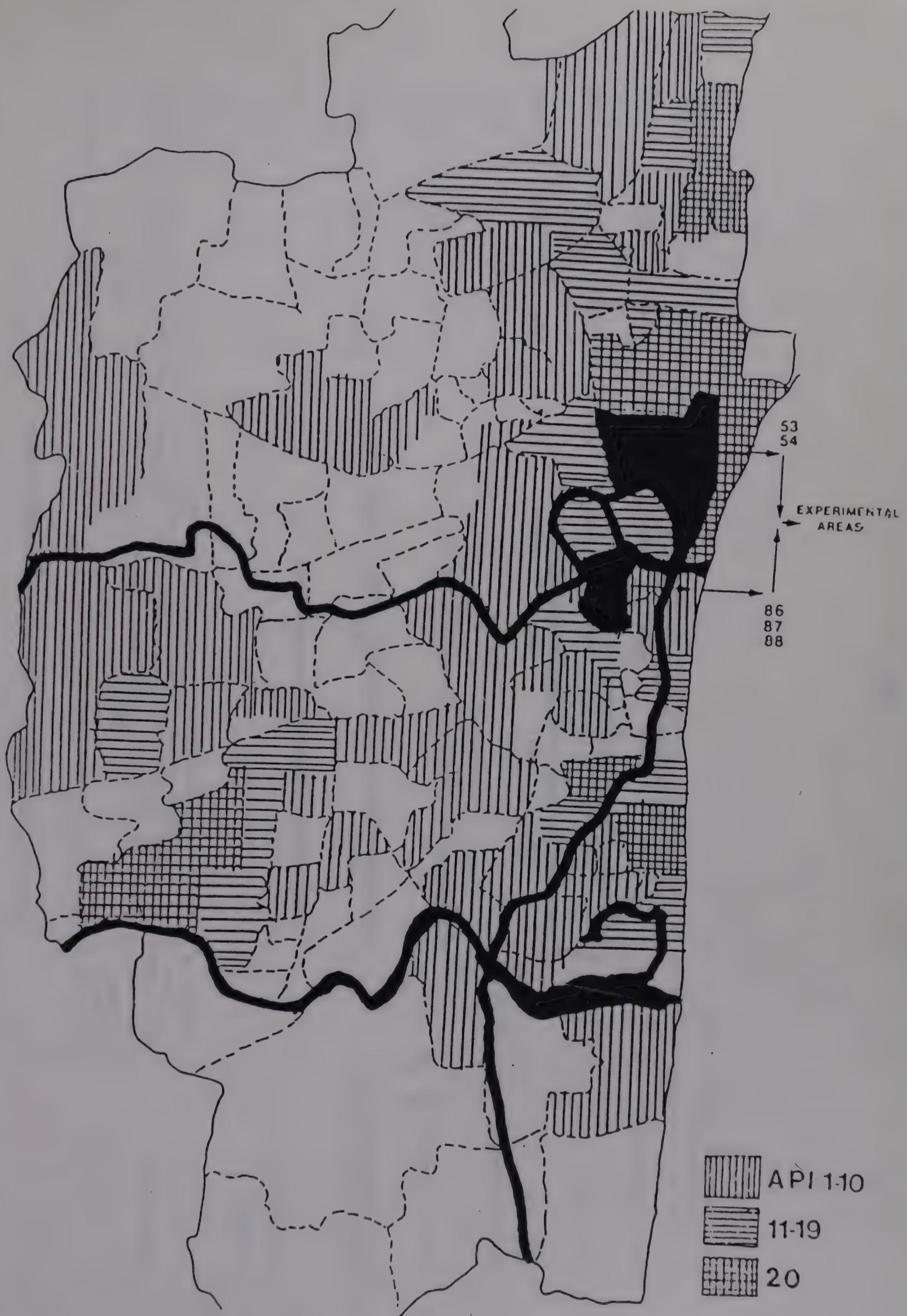


Fig 6: Division-wise API of Madras City showing Experimental areas.

TABLE 26 : MADRAS - TARGETS AND ACHIEVEMENTS**

ACTIVITIES	Status : 1986 : Till Dec : Jan-Mar : Apr-Jun : Jul-Sep : Oct-Dec :	1987	1988
Targets = Figures	Achievements = 000000 (cumulative data)		
1. <u>MRC</u>			
Urban areas	3 00000000000000000000000000000000 (5)	3 5 5 5	5 5 5 5
Population covered (in thousands)	100 00000000000000000000000000000000 (200)	200 -	250
Group meetings	2 00000000000000000000000000000000 (6)	3 5 7	10
Elimination of breeding in			
(i) OHT	797 00000000000000000000000000000000 (2894)	797 2894 2894	2894 2894
(ii) Wells	533 00000000000000000000000000000000 (2200)	533 2200 2200	2200 2200
(iii) Cisterns	3669 00000000000000000000000000000000 (8390)	3669 8390 8390	8390 8390
* : Maintenance			
** : Till November, 1987			

TABLE 27 : MADRAS - BREEDING STATUS AND SURVIVAL OF FISHES
IN OVERHEAD TANKS IN CORPORATION DIVISIONS 86-88

Month/Week		Number				Number positive	
		With fish	Without fish	Dry	Fish re-introduced	Without fish	With fish
March	I	644	77	76	77	6	0
	II	583	137	77	137	0	0
	III	630	102	65	102	13	0
	IV	694	55	48	55	0	0
	V	675	50	72	50	4	0
April	I	618	91	88	91	8	0
	II	540	131	126	131	5	0
	III	530	144	123	144	6	0
	IV	490	164	143	164	5	0
May	I	495	164	138	164	2	0
	II	564	120	113	120	4	0
	III	505	138	154	138	10	0
	IV	531	118	148	118	4	0
June	I	508	138	151	138	5	0
	II	495	157	145	157	11	0
	III	520	128	149	128	7	0
	IV	499	144	154	144	10	0
July	I	573	134	90	134	20	0
	II	571	137	89	137	13	0
	III	500	170	127	170	17	0
	IV	508	136	153	136	8	0
	V	512	140	145	140	15	0
August	I	506	166	125	166	18	0
	II	529	128	140	128	27	0
	III	525	132	140	132	24	0
	IV	466	214	117	214	29	0
September	I	371	100	110	100	13	0
	II	471	175	151	175	12	0
	III	512	151	134	151	8	0
	IV	520	158	119	158	23	0
October	I	437	175	185	175	30	0
	II	431	179	187	179	26	0
	III	531	129	137	129	39	0
	IV	525	112	160	112	35	0
November	I	544	140	113	-	27	0
	II	542	147	108	-	19	0
	III	532	146	119	-	16	0
	IV	569	140	88	-	8	0

Overhead tanks : 934 ; Overhead tanks open : 797

TABLE 28 : MADRAS - BREEDING STATUS AND SURVIVAL OF FISHES
IN WELLS IN CORPORATION DIVISIONS 86-88

Month/Week		Number			Number Positive		
		With fish	Without fish	Dry	Fish reintroduced	Without fish	With fish
March	I	504	23	6	41	0	0
	II	489	34	10	48	0	0
	III	499	24	10	29	0	0
	IV	517	12	4	12	0	0
	V	503	23	7	23	0	0
April	I	478	35	20	35	3	0
	II	458	54	21	54	1	0
	III	435	63	35	63	2	0
	IV	426	74	33	74	1	0
May	I	420	78	35	78	2	0
	II	414	70	49	70	0	0
	III	414	65	54	65	4	0
	IV	416	55	66	51	5	0
June	I	417	55	61	55	7	0
	II	382	69	82	69	2	0
	III	397	44	92	44	2	0
	IV	404	45	84	45	2	0
July	I	413	48	72	48	1	0
	II	379	67	87	67	4	0
	III	357	85	91	85	3	0
	IV	373	51	109	51	6	0
August	I	357	72	108	72	0	0
	II	360	64	113	64	3	0
	III	371	55	111	55	7	0
	IV	341	85	111	85	8	0
September	I	392	48	97	48	9	0
	II	349	77	111	77	2	0
	III	374	51	112	51	5	0
	IV	377	58	102	58	4	0
October	I	347	95	104	95	4	0
	II	313	104	129	104	16	0
	III	311	64	171	64	7	0
	IV	307	52	187	52	6	0
November	I	297	134	115	-	8	0
	II	378	67	101	-	8	0
	III	375	59	112	-	6	0
	IV	454	48	44	-	0	0

Total number of wells : 555 ; Number of wells open : 533

In one of the slums in division 88 where there is an aggregation of labour coming from different parts of Tamil Nadu, daily fever survey was instituted in March 1987. So far (upto November 87) 3717 blood smears were collected of which 456 were found positive (364 Pv, 83 Pf and 9 mixed infection) [Table 29 (ii)].

A malaria clinic of the MRC in Anna Nagar has been functioning since June 1987. So far 496 blood smears have been examined of which 225 were positive (215 Pv and 24 Pf) [Table 29 (iii)]. The problem of malaria in the experimental areas is the migration of peoples rather than indigenous transmission which has been successfully controlled by antilarval methods.

A. stephensi is the major species breeding in overhead tanks and wells. A. subpictus and A. vagus were the other two species encountered. A. stephensi populations are extremely low and evening catches introduced recently have produced good A. stephensi for the first time i.e. 36 specimen collected as against nil or one specimen. It may be noted that A. stephensi is the only vector species found in Madras city.

Demonstrations on malaria control were organised in 6 schools for the students of standard 9 to 12 in both the experimental areas.

6.2.7 BERHAMPUR

In December 1986, integrated disease vector control programme was launched in collaboration with Berhampur University in a coastal PHC of Berhampur sub-division of Ganjam district. The earmarked 103 sq. km study area comprises of 114 villages (population 1,10,431) of which 97,073 people living in 80 villages are being protected against malaria and filaria (Fig. 7). The targets are given in Table 30.

Fortnightly mosquito collections revealed the presence of two malaria vector species A. culicifacies and A. annularis and a filaria vector Cx. quinquefasciatus. Other prevalent species are A. nigerrimus, A. vagus, A. subpictus, A. aconitus, A. pallidus, A. barbirostris, Cx. tritaeniorhynchus and Cx. vishnui.

Major mosquito breeding sites of the area include ditches, drains, pits, ponds, wells, rice fields and intra-domestic containers. In all 1,32,292 peri-domestic and intra-domestic sites were checked for breeding and 21,703 (16.4%) were found positive. Of these, breeding was eliminated from 19052 (87.8%) sites. Approximately 20,000 fishes have been introduced in wells and ponds of the experimental villages to check larval populations. Two larvivorous fishes, Oryzias melastigma and Aplocheilus panchax have shown excellent larvivorous potential. Health education on malaria and filaria was imparted to 45,864 persons including school children by organising 59 health camps and 227 group meetings. Intervention measures were intensified to control mosquito breeding in all the known breeding habitats.

TABLE 29 : PARASITOLOGICAL FINDINGS (MRC & MADRAS CORPORATION)

(i) MASS BLOOD SURVEY

Period (1987)	Division number	BSC	Number Positive	Pv	Pf	Mix
February	86	579	0	0	0	0
March	88	756	35	28	7	0
July-August	53	3011	24	22	2	0
September	53	233	12	10	2	0
October	88	165	22	21	1	-
November	88	136	20	-	-	-

(ii) DAILY FEVER SURVEY IN S.M. NAGAR (CORPORATION DIVISION 88)

Month (1987)	BSC	Number positive	Pv	Pf	Mix
March	102	30	28	2	0
April	184	71	45	23	3
May	184	33	12	17	4
June	165	37	22	14	1
July	308	59	43	15	1
August	356	41	35	6	0
September	252	30	26	4	0
October	165	22	21	1	0
November	200	133	132	1	0

(iii) MALARIA CLINIC OF THE MRC AT ANNA NAGAR

Month (1987)	BSC	Number positive	Pv	Pf	Mix
June	50	16	15	1	0
July	25	14	12	2	0
August	95	44	42	2	0
September	90	48	44	4	0
October	97	45	44	1	0
November	139	58	44	14	0

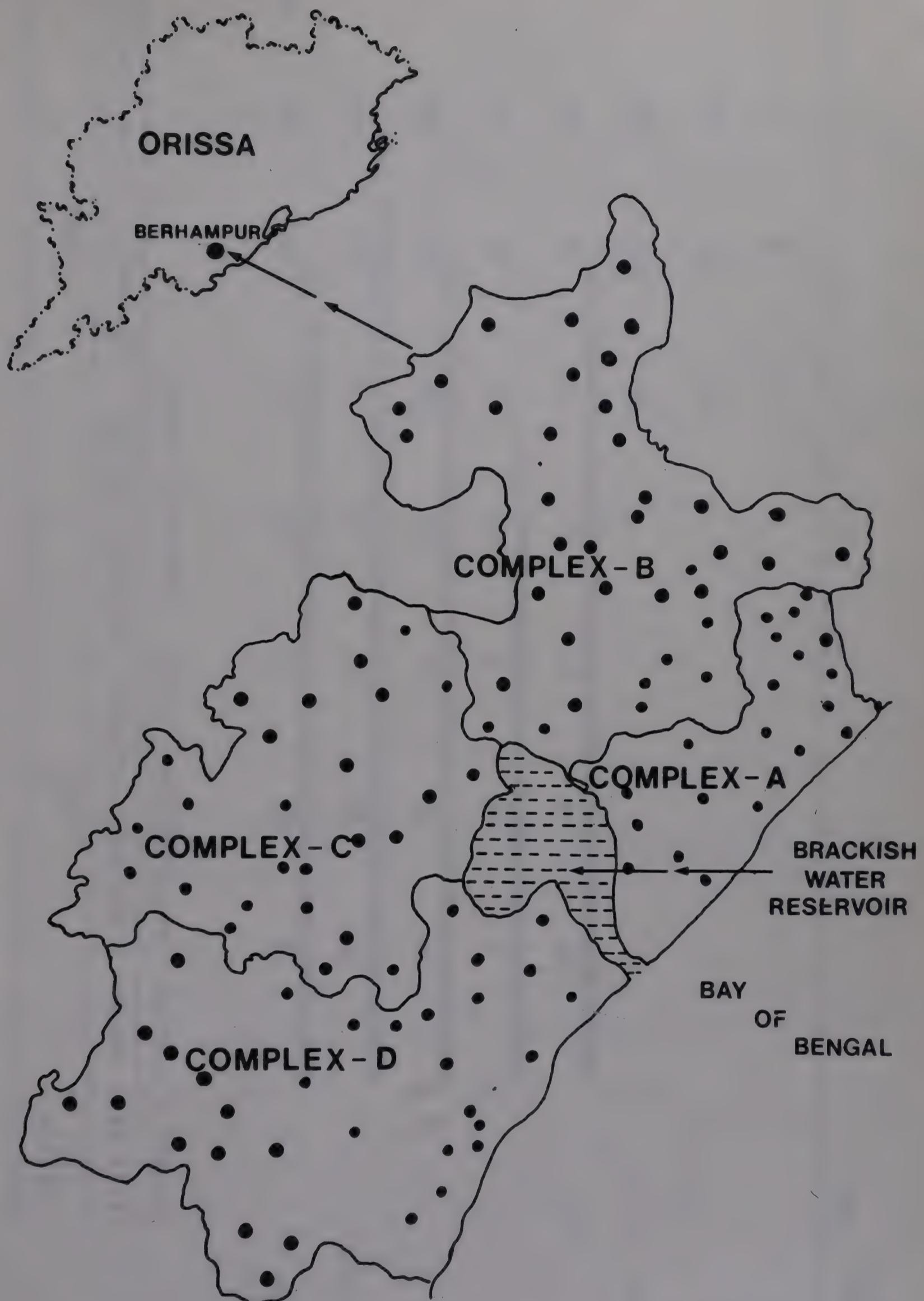


Fig 7: Showing the experimental Villages at the Berhampur Field Station

TABLE 30 : BERHAMPUR - TARGETS AND ACHIEVEMENTS*

Status :	1986 :	1987 :	1988
Till Dec:	Jan-Mar :	Apr-Jun :	Jul-Sep :
	Oct-Dec :	Jul-Sep :	Jan-Mar :
Targets = Figures	Achievements	Achievements	Achievements - 000000 (cumulative data)

HRC

* : till November, 1987
* : consolidation

There was some impact on reduction in mosquito densities, however the malaria vector densities have remained low in the experimental & control villages. The densities of Cx. quinquefasciatus were high in most villages (Table 31).

During weekly surveillance, blood smears were collected from suspected cases of malaria from all the study villages and examined in the laboratory. Month-wise SPR of experimental villages remained much lower than the control areas (Table 32). Average SPR from May to November was low by about 35% as compared to the control villages. Most of the malaria cases were due to population movement and not due to indigenous transmission. The area is endemic for filaria and results of surveys in 30 villages for malaria instead of filaria revealed high microfilaria rate as shown below.

Area (villages)	Population	BSE	Mf+	Mf rate
Coastal (15)	20,154	1940	28	1.4
Sub-coastal (15)	14,862	3504	370	10.5

Sub coastal areas has high mf rate. Population of Cx. quinquefasciatus are also high.

Because of low incidence of malaria it is proposed to shift the location of the field station to high malaria incidence area. State Government has been requested to suggest a suitable site.

6.2.8 SHANKARGARH

The integrated vector control of malaria project was started in July'87 at Shankargarh PHC of Allahabad District in U.P. Targets of the field station are given in Table 33.

The area is bordering Madhya Pradesh towards south. Population is 50-60% tribal, uneducated, backward and have poor socio-economic status. Terrain of the area is mainly plane with some hillrocks and forests with river and nullahs. Houses are mainly made of mud with straw thatched. Average room size is small 6' x 9' and 2-3 rooms in each house. Communication is poor for most of the villages. Main problem of the area is population immigration from U.P., M.P. districts to work in the stone quarry area. Breeding sites of the area are water collection in quarries, ditches, ponds, wells, rice field, mismanaged canals and intradomestic mud pots. Mosquito and the vector A. culicifacies densities are very high (Table 34). A. culicifacies breeds almost in all habitats. Other common anopheline species is A. subpictus. At present control work is in progress in 6 villages with population of 3213 and this will be extended to 15 villages from Jan'88 with a population of 5000.

TABLE 31 : BERHAMPUR - MAN HOUR DENSITY OF MOSQUITO
IN THE EXPERIMENTAL VILLAGES

Species		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
<hr/>									
(i) <u>Anophelines</u>									
<u>A. culicifacies*</u>	E	0.5	0.1	0.2	0.3	0.3	3.1	1.6	0.9
	C	0.2	0.1	0.0	0.9	0.8	4.3	2.6	1.4
<u>A. annularis*</u>	E	2.2	1.4	0.7	1.1	1.0	2.9	2.1	1.3
	C	2.4	1.6	2.0	1.1	1.2	2.8	0.9	0.8
<u>A. subpictus</u>	E	4.0	3.0	3.2	3.6	4.0	19.1	16.8	7.2
	C	7.7	3.7	4.6	6.0	5.4	23.9	23.8	9.2
<u>A. vagus</u>	E	3.7	2.4	3.5	3.0	3.0	13.0	13.4	5.0
	C	6.4	3.1	7.0	2.6	3.7	19.0	17.9	4.5
Others**	E	0.4	0.0	0.0	0.0	0.0	0.7	0.5	0.9
	C	1.6	0.2	0.0	0.1	0.0	0.7	1.2	0.1
(ii) <u>Culicines</u>	***								
<u>Cx. quinquefasciatus</u>	E	27.6	22.1	11.5	10.4	8.4	14.8	20.7	9.0
	C	37.8	41.3	28.6	21.0	19.1	24.1	27.7	10.1
<u>Cx. tritaeniorhynchus</u>	E	12.2	9.6	3.8	2.9	3.2	7.3	9.3	4.4
	C	11.8	7.7	5.1	4.9	3.6	10.5	12.2	5.1

* : Vectors of malaria

** : A. barbirostris, A. aconitus, A. nigerrimus, A. pallidus

*** : Vector of filaria

TABLE 32 : BERHAMPUR - RESULTS OF PARASITOLOGICAL SURVEYS
TO MONITOR MALARIA INCIDENCE

Month 1987	Population	BSC	Total +ive	Pv	Pf	Mix	SPR	SFR	Pf%
EXPERIMENTAL									
May	24,182	351	7	5	2	-	2.0	0.6	28.6
June	36,822	370	4	4	-	-	1.1	-	-
July	41,361	459	6	6	-	-	1.3	-	-
August	60,304	673	12	8	3	1	1.8	0.6	33.3*
September	68,020	518	11	9	2	-	2.1	0.4	18.1
October	78,948	483	10	7	3	-	2.1	0.6	30.0
November	89,472	543	20	11	7	2	3.7	1.65	45.0*
Total	89,472	3397	70	50	17	3	2.06	0.59	28.5*

CONTROL

May	3,265	50	-	-	-	-	-	-	-
June	3,265	37	3	1	2	-	8.1	5.4	66.6
July	2,488	23	1	1	-	-	4.3	-	-
August	2,488	64	4	2	2	-	6.2	3.1	50.0
September	4,453	25	4	4	-	-	16.0	-	-
October	4,453	40	3	3	-	-	7.5	-	-
November	8,594	58	4	3	-	1	6.9	1.72	25.0*
Total	8,594	297	19	14	4	1	6.39	1.68	26.3*

* : Including mixed infection

TABLE 33 : SHANKARGARH - TARGETS AND ACHIEVEMENTS*

	Status	1986	1987	1988
ACTIVITIES	Till Dec: Jan-Mar : Apr-Jun : Jul-Sep : Oct-Dec :			
Targets * Figures	Achievements	Apr-Jun : Jan-Mar : Jul-Sep : Oct-Dec :		
	Achievements - 000000 (cumulative data)			
1. MRC				
Villages covered	0000000000 (6)	10	10	15
Population covered	00000000 (3213)	5000	7500	10000
Soak pits	-	-	25	50
Hatcheries maintained	000000000000000000000000 (1)	1	1	2
Health camps	0000000000000000000000 (10)	-	12	20
Group Meetings	00000000000000000000000000000000 (74)	-	50	100
Shram dans	00000000000000000000000000000000 (74)	-	150	175
Play grounds	00000000000000000000000000000000 (74)	-	40	50
Well caping	00000000000000000000000000000000 (74)	-	200	200
2. HWDDB/DOENF				
Saplings (in thousands)	00000000000000000000000000000000 (662)	-	-	-
Nursery established	00000000000000000000000000000000 (662)	1	-	-
Tree plantation	00000000000000000000000000000000 (662)	500	-	-
3. DNES				
Solar cooker sold	00000000000000000000000000000000 (662)	5	10	20
Improved chulhas	00000000000000000000000000000000 (662)	-	20	30
* : Till November, 1987				50

TABLE 34 : SHANKARGARH - MONITORING OF ENTOMOLOGICAL INDICES

Month (I & II half)	E X P E R I M E N T A L			C O N T R O L		
	Density			Density		
	Mosquito	Anopheline	Vector	Mosquito	Anopheline	Vector
June						
I	-	-	-	-	-	-
II	8.00	8.00	4.00	8.00	8.00	4.00
July						
I	11.30	10.00	2.49	13.00	7.00	1.34
II	99.50	89.40	22.34	57.62	48.90	12.21
August						
I	110.75	104.45	26.11	52.29	48.20	12.05
II	142.17	137.42	34.26	129.30	123.55	33.40
September						
I	159.66	155.33	51.70	136.07	128.84	42.90
II	108.63	103.90	34.30	168.70	164.70	54.90
October						
I	45.22	41.05	10.26	144.33	108.09	36.05
II	40.80	29.30	7.32	58.10	46.80	11.70
November						
I	40.83	35.50	8.81	87.16	76.25	19.06
II	34.75	32.80	8.20	83.71	75.50	18.87

For biological control presently Poecilia reticulatus and Rasbora species are being used in permanent water collection.

Monitoring of parasitological indices was started in August 1987 (Table 35). The impact of intervention measures may take about a year or so before any evidence of reduction in transmission could be observed.

TABLE 35 : SHANKARGARH - EPIDEMIOLOGICAL DATA FOR EXPERIMENTAL AND CONTROL AREA

Month (1987)		BSC	Positive cases	Pv	Pf
August 1987	Expt	96	26	26	-
	Cont	29	8	7	1
September	Expt	533	207	185	22
	Cont	42	10	9	1
October	Expt	746	204	115	89
	Cont	117	25	16	9
November	Expt	452	124	38	86
	Cont	6	1	1	-

6.2.9 DELHI:

In Delhi, two areas were selected for integrated control of malaria, viz., (i) South Delhi and (ii) Shahadara. In the former area the incidence of malaria is high and in the later mosquito nuisance is very high. Targets for the Delhi field are given in Table 36. The areas under the project are shown in Fig. 8 and 9.

SOUTH DELHI AREA

The Project was launched in December 1986 to demonstrate the feasibility of mosquito control in malaria endemic zone of South Delhi. The study area is given in Fig. 8. Sarai Kale Khan and surrounding colonies were selected as experimental area with a population of about 30,000 and Khizarabad as control area with an approximate population of 8,000. Cx. quinquefasciatus, A. stephensi, A. culicifacies and Aedes aegypti are the four major mosquito species available in Delhi. The potential breeding sites of the experimental area are the Barapulla Nullah, low level areas, ponds, broken and blocked drains, over head tanks etc.

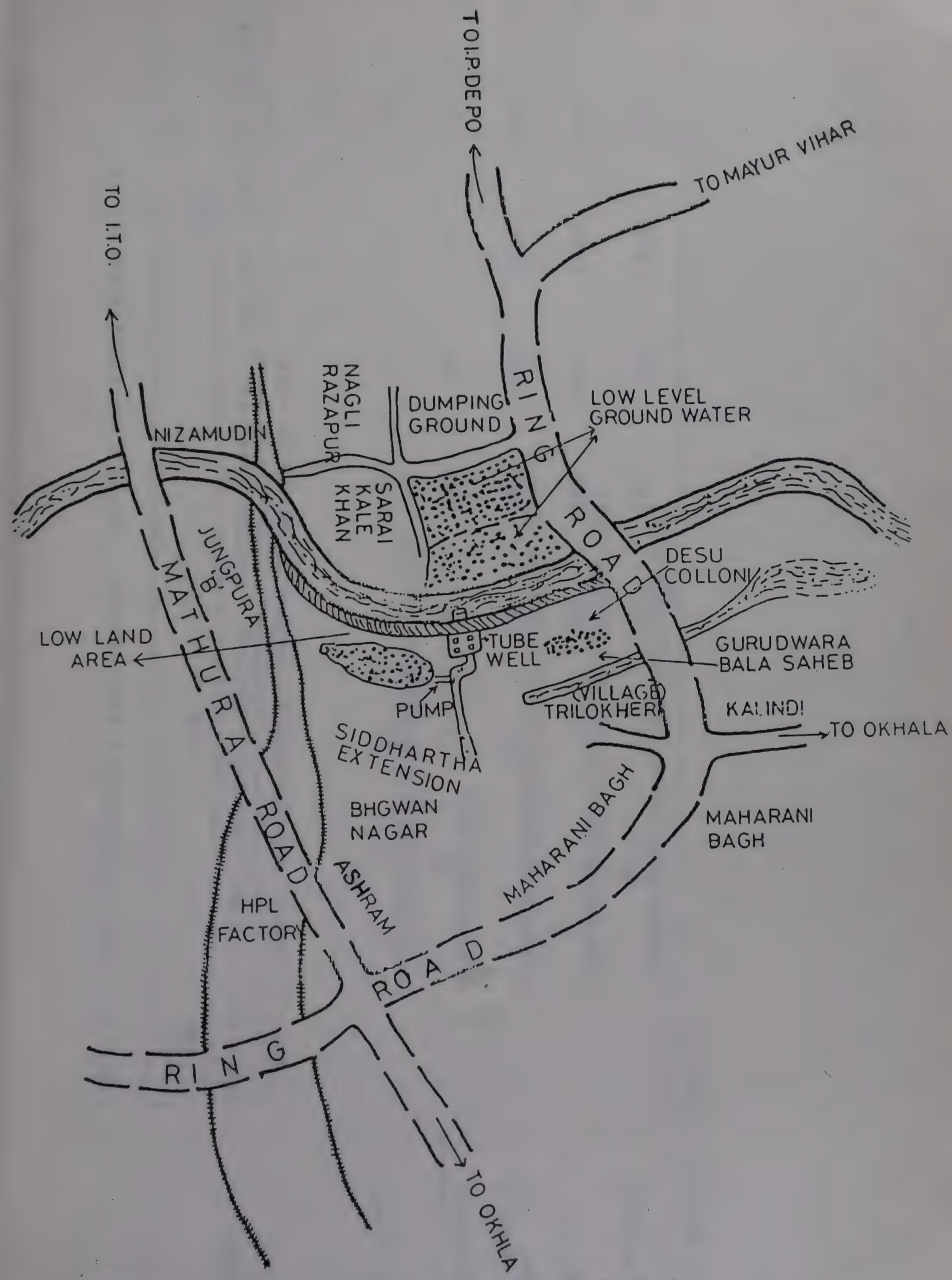


Fig 8 : Showing the Experimental areas in South Delhi.

TABLE 36 : DELHI (SHAHADARA & SOUTH DELHI) - TARGETS AND ACHIEVEMENTS*

	1986	1987	1988
ACTIVITIES	Till Dec	Jan-Mar	Apr-Jun
Targets = Figures = Achievements - 000000 (cumulative data)			
1. MRC			
Colonies covered	6	10	12
	0000000000000000000000000000 (12)	14	18
Population covered (in thousands)	50	75	100
	000000000 (50)	100	125
Channelization of drains	-	200	500
	0000000000000000000000000000 (709)	800	1000
OHT survey	-	-	1000
	0000000000000000000000000000 (905)	1250	1500
Group meetings	30	75	200
	0000000000000000000000000000 (204)	250	350
			400
			450
			500

* : Till November, 1987

Besides the routine cleaning and channelization for reducing the breeding sites, the intervention work included the application of EPS beads in unused wells of the experimental area. Larvicides spraying (Symbush) is being carried out fortnightly in experimental area, since September 1987.

Field trials of Bacillus sphaericus (as part of biological control of mosquito) showed that they are effective against *Culex* larvae, (not as much against Anopheline larvae) for a period up to 2 months after its first application.

Cypermethrin (larvicide) spraying was done fortnightly in experimental area of Delhi during the month of September and October 1987. This has shown considerable effectiveness to reduce the larval density especially in the stagnant water.

Adult mosquito density was assessed by suction tube catching method. Anopheline density was very high during May and August to November 1987. The average per man hour vector density was high in the month of September, and October in experimental area. The average vector density came down to 7 in the month of November (Table 37). The vectors in South Delhi area are A. stephensi and A. culicifacies. A. annularis was also encountered as secondary vector in the experimental area.

Twenty eight P. vivax cases were detected from 452 blood smears collected from the experimental area and 3 P. vivax cases from 45 slides from control area (Table 38).

SHAHADARA AREA

Experimental area includes Kanti Nagar and surrounding colonies with an approximate population of 25,000. Khajuri and adjacent colonies with a population of about 25,000 were selected as control area with somewhat similar mosquitogenic and malariogenic condition, about 5 Km away from the experimental area. The IDVC project was launched in January 1987 to demonstrate the feasibility of mosquito control in Shahadara area. Drain No. 1, water logged areas, pools, ditches, ponds and water collections in streets and vacant plots are the potential mosquito breeding sites.

Intervention work started in February 1987 and attention was given mainly for draining the stagnant water by channelization and cleaning of drains and filling of ditches thereby reducing the number of mosquito breeding sites. Weekly survey of overhead tanks and coolers were carried out for spotting and eliminating the breeding of mosquitoes.

Entomological monitoring started in April 1987. Total mosquito density was high in control area as compared to the experimental zone (Table 39). The predominant Anopheline mosquito species was A. subpictus no A. culicifacies or A. stephensi adults could be found in experimental areas except during the month of August.

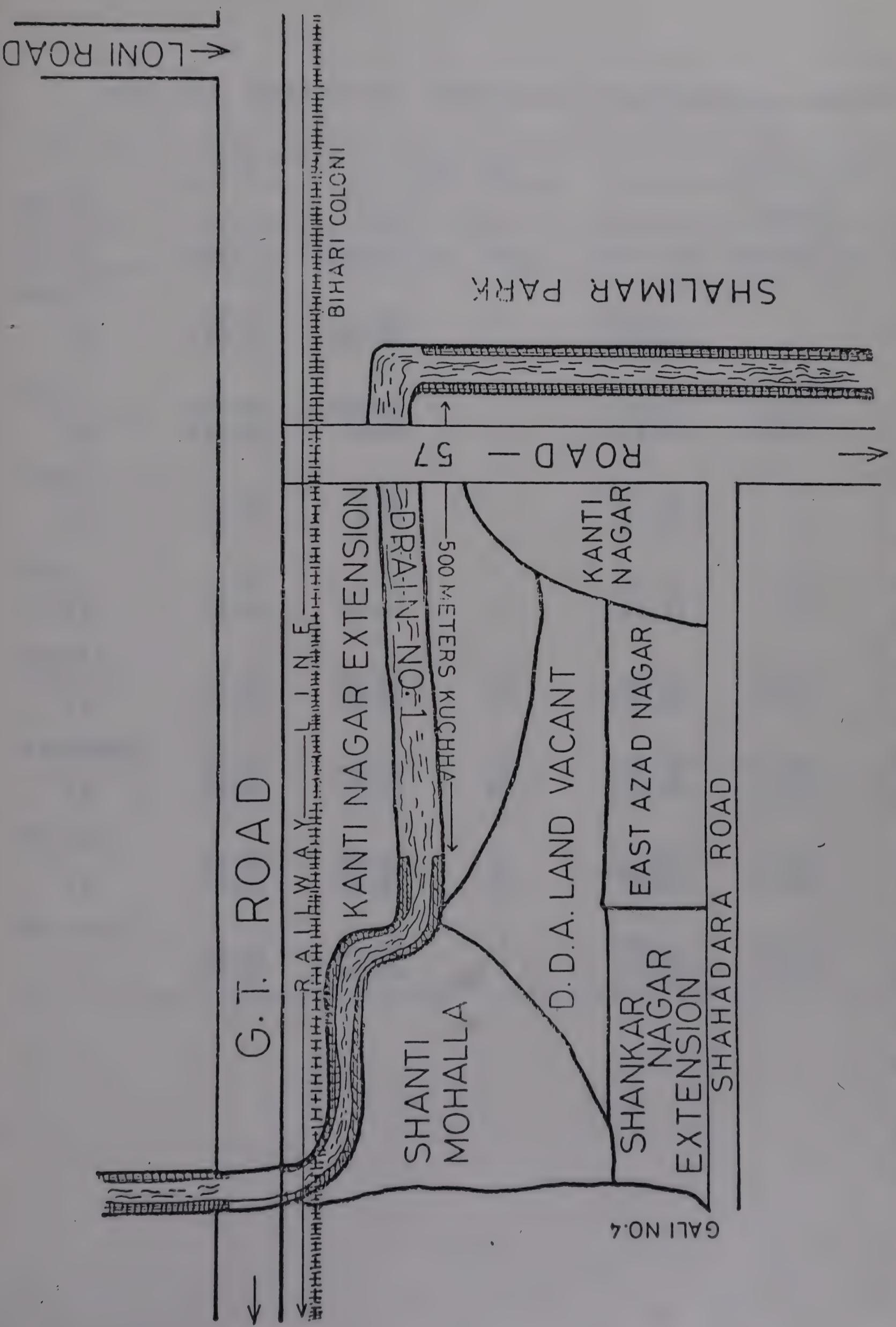


Fig 9 : Showing the Experimental areas in Shahadra.

TABLE 37 : SOUTH DELHI - MONITORING OF ENTOMOLOGICAL INDICES

Month (I & II half)	E X P E R I M E N T A L			C O N T R O L		
	Mosquito	Anopheline	Vector	Mosquito	Anopheline	Vector
April						
I	138.00	44.00	-	319.00	-	-
II	182.00	103.00	-	353.00	-	-
May						
I	222.00	102.00	-	396.00	150.00	-
II	185.00	94.00	-	359.00	162.00	-
June						
I	89.00	2.00	-	111.00	-	-
II	38.00	4.00	-	94.00	-	-
July						
I	12.89	1.79	-	24.50	1.00	-
II	19.86	10.46	-	22.25	5.75	-
August						
I	35.00	22.00	16	56.00	37.00	13
II	78.00	49.00	23	128.00	81.00	28
September						
I	81.00	41.00	40	216.00	154.00	155
II	76.00	42.00	33	240.00	75.00	73
October						
I	96.00	53.00	41	141.00	43.00	33
II	69.00	34.00	30	91.00	23.00	9
November						
I	50.00	22.00	9	74.00	16.00	6
II	29.00	10.00	4	72.00	5.00	1

TABLE 38 : SOUTH DELHI - MONITORING OF PARASITOLOGICAL INDICES

Month (1987)	Population	BSC	+ive	Pv	Pf	SPR	SfR
EXPERIMENTAL							
July	30,000	60	11	11	-	18.3	-
August	30,000	93	7	7	-	7.5	-
September	30,000	130	4	4	-	3.1	-
October	30,000	87	5	5	-	5.7	-
November	30,000	82	1	1	-	1.21	-
Total	30,000	452	28	28	-	6.19	-
CONTROL							
July	8,000	5	1	1	-	20.00	-
August	8,000	7	-	-	-	-	-
September	8,000	14	1	1	-	7.14	-
October	8,000	8	1	1	-	12.5	-
November	8,000	11	-	-	-	-	-
Total	8,000	45	3	3	-	6.66	-

TABLE 39 : SHAHADARA (DELHI) - MONITORING OF ENTOMOLOGICAL INDICES

Month (I & II half)	E X P E R I M E N T A L			C O N T R O L		
	Density			Density		
	Mosquito	Anopheline	Vector	Mosquito	Anopheline	Vector
April						
I	54.65	-	-	252.26	-	-
II	52.03	-	-	201.50	-	-
May						
I	110.00	-	-	318.00	-	-
II	58.00	-	-	280.00	-	-
June						
I	42.93	-	-	155.50	0.11	-
II	43.09	0.04	-	210.55	0.22	-
July						
I	31.66	-	-	121.80	1.80	-
II	41.50	0.10	-	114.50	2.30	-
August						
I	54.00	2.00	0.10	112.00	13.00	0.12
II	34.00	1.00	-	124.00	16.00	-
September						
I	52.00	1.00	-	178.00	8.00	-
II	55.00	3.00	-	196.00	7.00	-
October						
I	34.00	3.00	-	68.00	7.00	-
II	30.00	5.00	-	189.00	10.00	-
November						
I	47.00	4.00	-	272.00	9.00	-
II	21.00	0.20	-	146.00	8.00	-

From the experimental area a total of 474 slides were collected till November 1987. Out of which 7 were found positive for P. vivax and one was positive for P. falciparum. From the control area a total of 221 slides were collected and 2 were positive for P. vivax (Table 40). This area has low incidence of malaria which is sustained by population movement.

Series of meetings, slide shows and door to door health education programmes were conducted in the experimental area. Shramdan work in West Kanti Nagar resulted in filling up of low lying and water logged roads and streets.

Intersectoral collaboration from departments like Fisheries, Horticulture, Flood, Slum, MCD etc., is being solicited.

During a recent meeting with the Secretary Health Delhi UT it was decided that MCD would suggest an area with high malaria incidence and low inward migration. In this area MRC would take up the demonstration of malaria control. Selection of site would be approved after a joint meeting of the MCD & MRC and would have the approval of the Lt Governor, Delhi.

TABLE 40 : SHAHADARA (DELHI) - MONITORING OF PARASITOLOGICAL INDICES

Month (1987)	Population	BSC	+ive	Pv	Pf	SPR	SfR
EXPERIMENTAL							
July	24,585	22	4	3	1	18.2	4.54
August	24,585	54	2	2	-	3.7	-
September	24,585	159	2	2	-	1.3	-
October	24,585	115	-	-	-	-	-
November	33,085	124	-	-	-	-	-
Total	33,085	474	8	7	1	1.68	0.21
CONTROL							
July	24,594	11	1	1	-	9.09	-
August	24,594	21	1	1	-	4.76	-
September	24,594	72	-	-	-	-	-
October	24,594	59	-	-	-	-	-
November	24,594	58	-	-	-	-	-
Total	24,594	221	2	2	-	0.90	-

6.2.10 SONAPUR:

Integrated disease vector control was launched in 7 villages of Sonapur in 1986 (Fig. 10). The study has been extended to 42 villages covering a population of about 14,000 (Table 41).

The anopheline fauna of Sonapur comprises of about 20 species out of which A. nivipes, A. minimus, A. balabacensis, A. varuna, the vectors of malaria dominated the collections. Initially the mosquito density was high in experimental areas as compared to the control, but in later months it was not so (Table 42).

SPR in 1986 and early 1987 was high compared to late 1987, although slide collection was 3 to 4 times more. Table 43 also shows that P. falciparum incidence has remained higher than P. vivax throughout the year.

Six species of larvivorous fishes Ambassis nama, Anaban Sps, Badis badis, Channa gachua, C. punctatus, Chela bacaila, Puntius Sps, Rasboria demconius were introduced into ponds and wells. EPS beads were also introduced into the unused wells. The intradomestic breeding sources were checked once a week and all the positive containers were turned upside down and breeding eliminated.

Total 24,000 trees were planted, 15 biogas plants and 156 improved chulhas were installed in different experimental villages. Also 33 camps were organised for imparting health education to the villagers.

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Fig 10 : Showing the experimental Villages (Solid Circles) in Sonapur PHC

TABLE 41 : SONAPUR - TARGETS AND ACHIEVEMENTS*

	ACTIVITIES	Targets	Figures	Achievements	Targets	Figures	Achievements
		Till Dec : Jan-Mar	Apr-Jun : Jul-Sep	Oct-Dec	Till Dec : Jan-Mar	Apr-Jun : Jul-Sep	Oct-Dec
1. <u>MRC</u>	Villages covered	15	35	95	95	110	
	Population covered (in thousands)	000000000000000000000000 (42)					
	Hatcheries maintained	8	10	30	50	57	
	Health camps	4	10	20	20	20	
	Group meetings	10	50	80	120	125	
	Shram dars	00000000000000 (22)					
	Play grounds	25	40	50	60	70	
2. <u>NWDB/DOENF</u>	Saplings (in thousands)	00000000000000000000000000000000 (47.5)			50	60	
	Nursery established	00000000000000000000000000000000 (19)					
	Tree plantation (in thousands)	00000000000000000000000000000000 (24.2)			4	5	
3. <u>DNES</u>	Biogas plants	5	15	25	30	40	
	Improved chulhas	50	150	250	300	350	

*: Till November, 1987

TABLE 42 : SONAPUR - MONITORING OF ENTOMOLOGICAL INDICES

Month (I & II half)	E X P E R I M E N T A L			C O N T R O L		
	Density			Density		
	Mosquito	Anopheline	Vector	Mosquito	Anopheline	Vector
January						
I	33.20	6.60	-	27.00	2.00	-
II	48.20	16.30	-	32.00	7.50	-
February						
I	126.68	11.20	-	77.00	4.00	-
II	81.79	12.10	-	65.00	10.00	-
March						
I	109.16	19.05	-	55.00	6.00	-
II	89.13	26.12	-	91.00	16.00	-
April						
I	100.31	33.75	-	83.66	23.00	-
II	69.60	27.67	-	54.00	19.75	-
May						
I	79.94	41.84	12.76	73.31	22.81	-
II	58.97	28.88	-	45.50	18.25	9.47
June						
I	91.34	43.34	22.81	-	-	-
II	97.80	56.60	41.00	-	-	-
July						
I	136.66	69.25	42.58	155.00	44.00	16.0
II	122.95	45.20	16.80	111.00	14.00	2.0
August						
I	148.07	79.80	13.53	149.50	46.00	11.50
II	106.03	66.79	13.73	133.00	26.33	8.08
September						
I	122.23	72.69	27.76	166.75	70.75	21.00
II	117.50	70.60	20.60	121.00	65.00	21.05
October						
I	128.64	76.18	39.18	147.67	63.00	24.67
II	126.82	55.46	15.73	227.33	59.00	22.67
November						
I	118.14	34.87	11.20	153.75	56.75	19.50
II	118.44	35.78	11.01	149.62	48.33	19.86

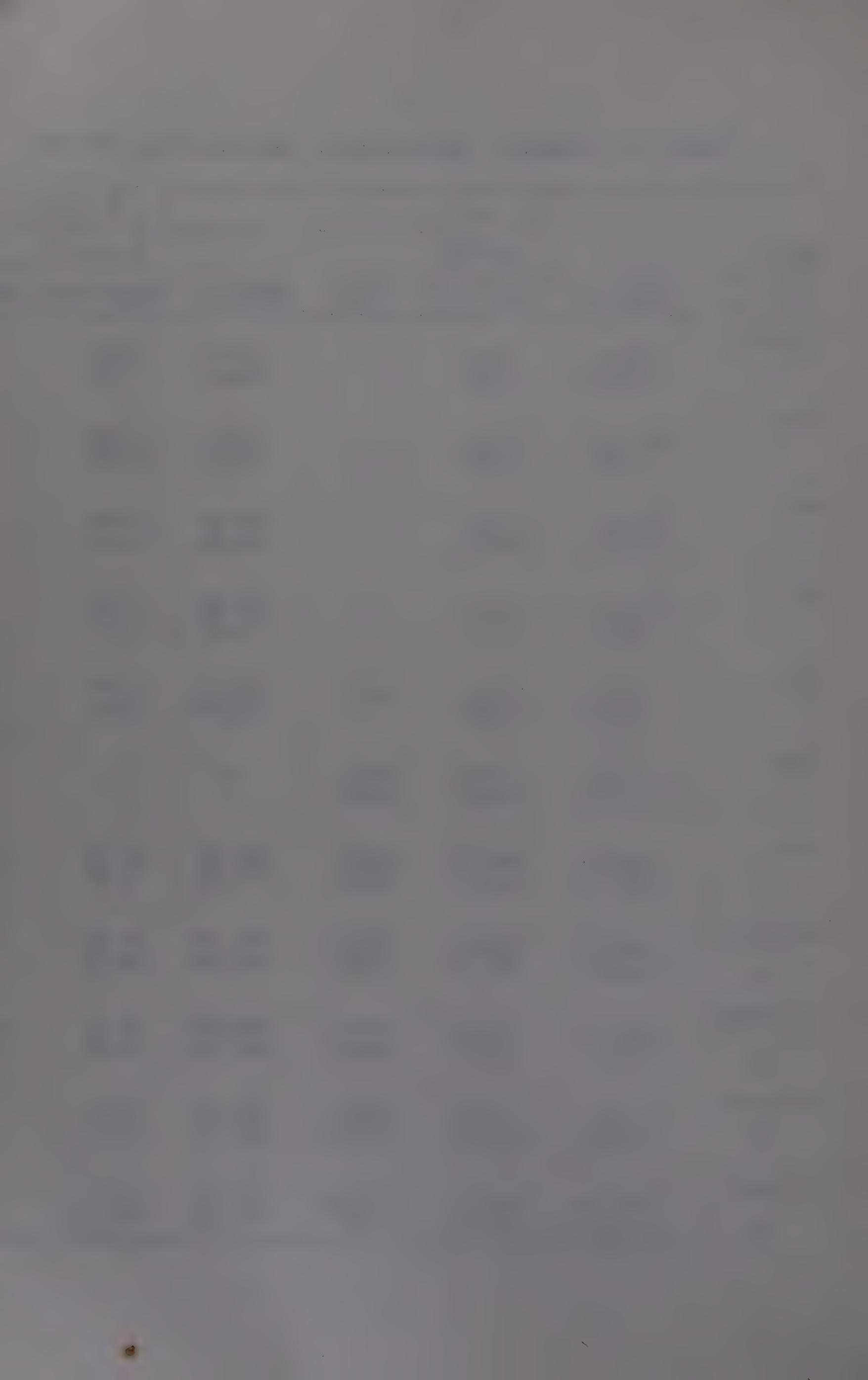
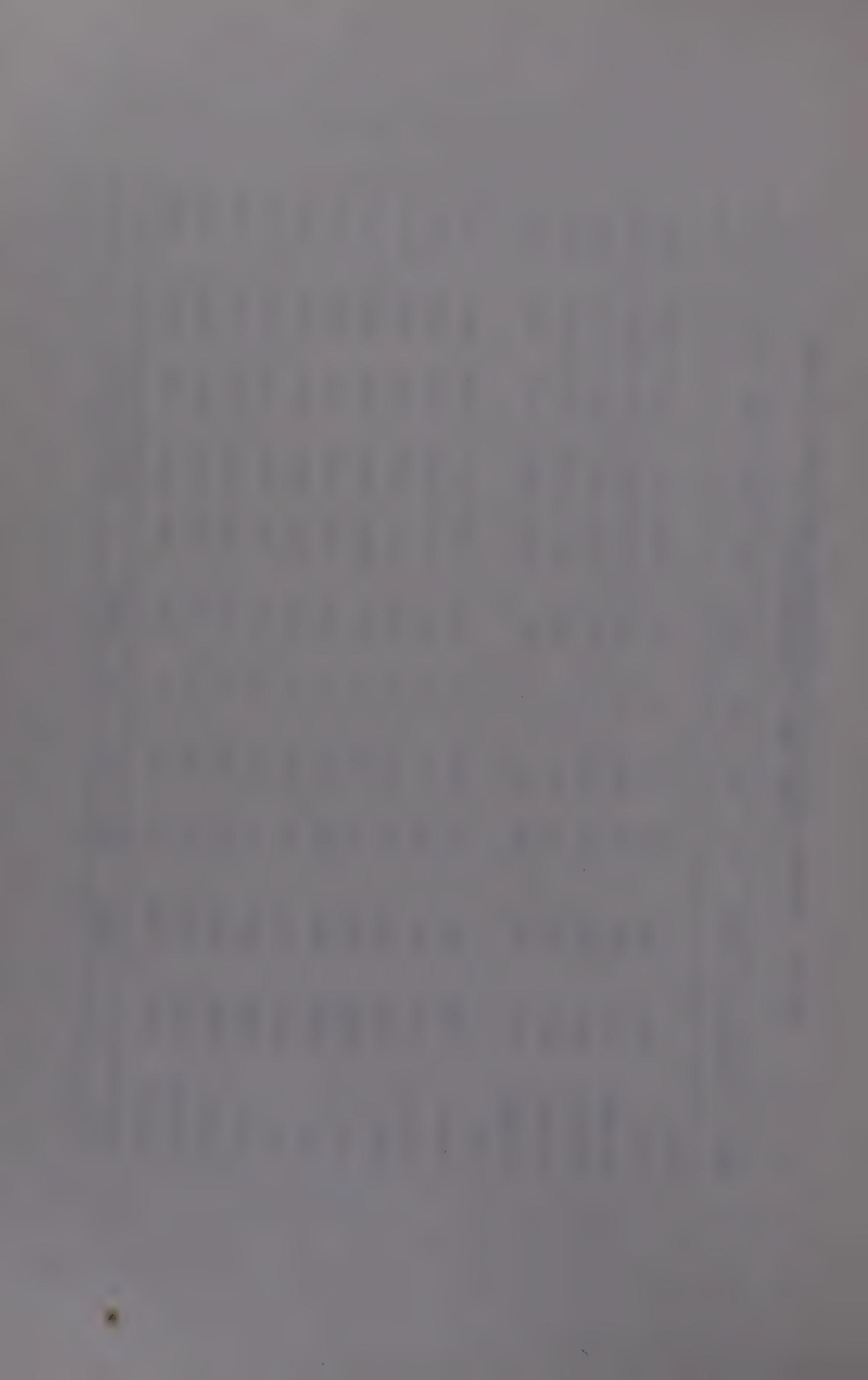


TABLE 43 : SONAPUR - MONTH WISE EPIDEMIOLOGICAL DATA OF STUDY VILLAGES
 (AUGUST 1986 - OCTOBER 1987)

Month	Population	BSC/E	Pv	Pf	Mix	Total	BER	SPR	SFR	PI	FI
<hr/>											
1986											
August	306	242	42	53	0	95	79.08	39.26	21.90	310.46	175.20
September	1473	294	9	165	0	170	19.96	59.18	56.12	118.13	112.02
October	2477	179	16	93	2	111	7.23	62.01	59.90	44.81	37.84
November	2477	476	22	275	1	298	19.21	62.60	57.77	120.31	111.02
December	2797	471	18	196	4	218	16.84	46.28	41.61	77.94	70.07
<hr/>											
1987											
January	3978	136	21	99	0	120	4.67	64.51	53.22	30.11	24.89
February	7159	1014	102	172	0	274	14.16	27.02	16.96	39.27	24.02
March	9959	1339	51	127	0	178	13.44	13.29	9.48	17.37	12.75
April	10192	939	45	70	2	117	09.21	12.46	07.45	11.48	06.86
May	11076	1051	67	130	3	200	9.49	19.02	12.36	18.06	11.74
June	13978	1124	57	155	0	212	8.04	18.86	13.79	15.17	11.09
July	13978	1346	34	231	0	265	9.63	19.68	17.16	18.96	16.52
August	13978	889	62	139	2	203	6.36	22.83	15.63	14.52	9.94
September	13978	1214	71	126	0	197	8.68	16.22	10.37	14.09	9.01
October	13978	787	54	122	0	176	5.63	22.36	15.50	12.59	3.73
Total	-	11551	671	2153	14	2858	-	24.50	18.60	-	-



7. ADDITIONAL INFORMATION :

7.1 RESEARCH PAPERS PUBLISHED :

- (i) Bioenvironmental control of malaria in Nadiad, Kheda district, Gujarat. Indian J. Malariaiology, 23(2) : 95-118, 1986
- (ii) Cost effectiveness of the bio-environmental control of malaria in Kheda district, Gujarat. Indian J. Malariaiology, 23(2) : 141-146, 1986
- (iii) Community based integrated vector control of malaria in India. In Proc. Symposium in vaccinology. M/S Springer Verlog (In press).
- (iv) Winning the War Against Malaria In Science Age titled "Malaria:Eradicating Mosquitoes without Insecticides" pp. 49-54, November 1986
- (v) Studies on the role of indigenous fishes in the control of mosquito breeding. Indian J. Malariaiology 24(1) : 73 -78, 1987
- (vii) Small scale field trials with Polystrene beads for the control of mosquito breeding. Indian J. Malariaiol. 24(2) : In Press (1987)
- (viii) Community Based Malaria Control in India. Parasitology Today : 222 -226, 1987
- (ix) Proceedings of the ICMR/WHO workshop to Review Research Results on Community Participation for Disease Vector Control (3-9 February 1986)
- (x) Review of Integrated Control of Malaria in Kheda district, Gujarat, India. In Community Participation for Disease Vector Control : 59 - 84, 1987

7.2 HAND OUTS :

- (i) Bio-environmental control of malaria
- (ii) Bio-environmental control of Industrial malaria
- (iii) Malaria ki Rokhtham (Hindi)
- (iv) Malaria and Tribal Health
- (v) Malaria Control in Kumaon foothills
- (vi) The Kheda Experiment
- (vii) Bio-environmental control of malaria in Gujarati, Oriya, Tamil.

7.3 EXHIBITION :

- (i) Fighting Industrial Malaria
- (ii) Malaria and Tribal Health,
- (iii) Malaria Control in Kumaon foothills
- (iv) Do you know ..? (Gujarati)

7.4 VIDEO-FILM :

Fighting malaria in Shahjahanpur (English and Hindi).

Slide Show (AV), Malaria control in Shahjahanpur

7.5 RADIO TALK :

Bioenvironmental control of malaria (In Hindi)

Malaria control in Nadiad, Ahmedabad

Malaria in Madras and innovative methods of malaria control, Madras

7.6 IMPORTANT VISITORS :

Governor Shri R.K Trivedi and DG, ICMR, Dr. A.S. Paintal visited the Nadiad field station.

Prof. M.G.K Menon, Member Planning Commission and SA to PM accompanied with the senior officers of the Planning Commission and DM Saharanpur visited Hardwar field station.

7.7 In-depth assessment of the community based integrated vector control of malaria project in Nadiad, October 12-23, 1987

7.8 STAFF POSITION :

The staff position of the MRC HQs and its field stations on integrated control of malaria is given below in Table 44.

TABLE 44 : STAFF POSITION AS ON 30th NOVEMBER, 1987

Staff	HQs	Nad	Hal	Har	Sha	Man	Mad	Ber	Shan	Del	Son
SRO	1	1	0	1	0	1	1	0	1	1	1
RO	1	3	2	2	4	0	1	2	0	1	2
ARO/TO	0	3	1	1	4	0	0	1	0	1	0
RA	0	2	0	0	0	0	0	0	1	0	0
OS	0	1	0	0	0	0	0	0	0	0	0
HE	0	2	2	0	0	0	0	1	0	0	0
LT	3	0	1	1	4	0	3	4	1	0	3
JE/AE	0	1	0	0	0	0	0	0	0	0	0
Microscopist	0	8	1	1	1	0	0	0	0	1	0
IC	0	6	2	1	2	4	4	6	2	0	4
FLA	2	9	7	6	5	6	4	9	3	5	7
LA	0	5	1	1	1	0	0	0	0	0	0
Programmer	4	0	0	0	0	0	0	0	0	0	0
TA	2	2	1	1	1	0	0	0	0	0	0
LDC	5	1	1	1	2	2	0	2	1	1	0
UDC/Asstt.	1	0	0	1	0	1	0	1	0	0	0
Driver	2	15	4	4	4	5	2	3	2	3	2
Peon	0	2	2	2	1	0	0	2	0	4	0
Chowkidar	0	0	0	0	0	2	0	1	1	3	0
Total	21	61	25	23	29	21	15	32	12	20	19

Note: Staff in position = 278

Vacant posts = 125

- HQs : Delhi HQ, MRC
- Nad : Nadiad
- Hal : Haldwani
- Har : Hardwar
- Sha : Shahjahanpur
- Man : Mandla
- Mad : Madras
- Ber : Berhampur
- Shan : Shankargarh
- Del : Delhi
- Son : Sonapur

